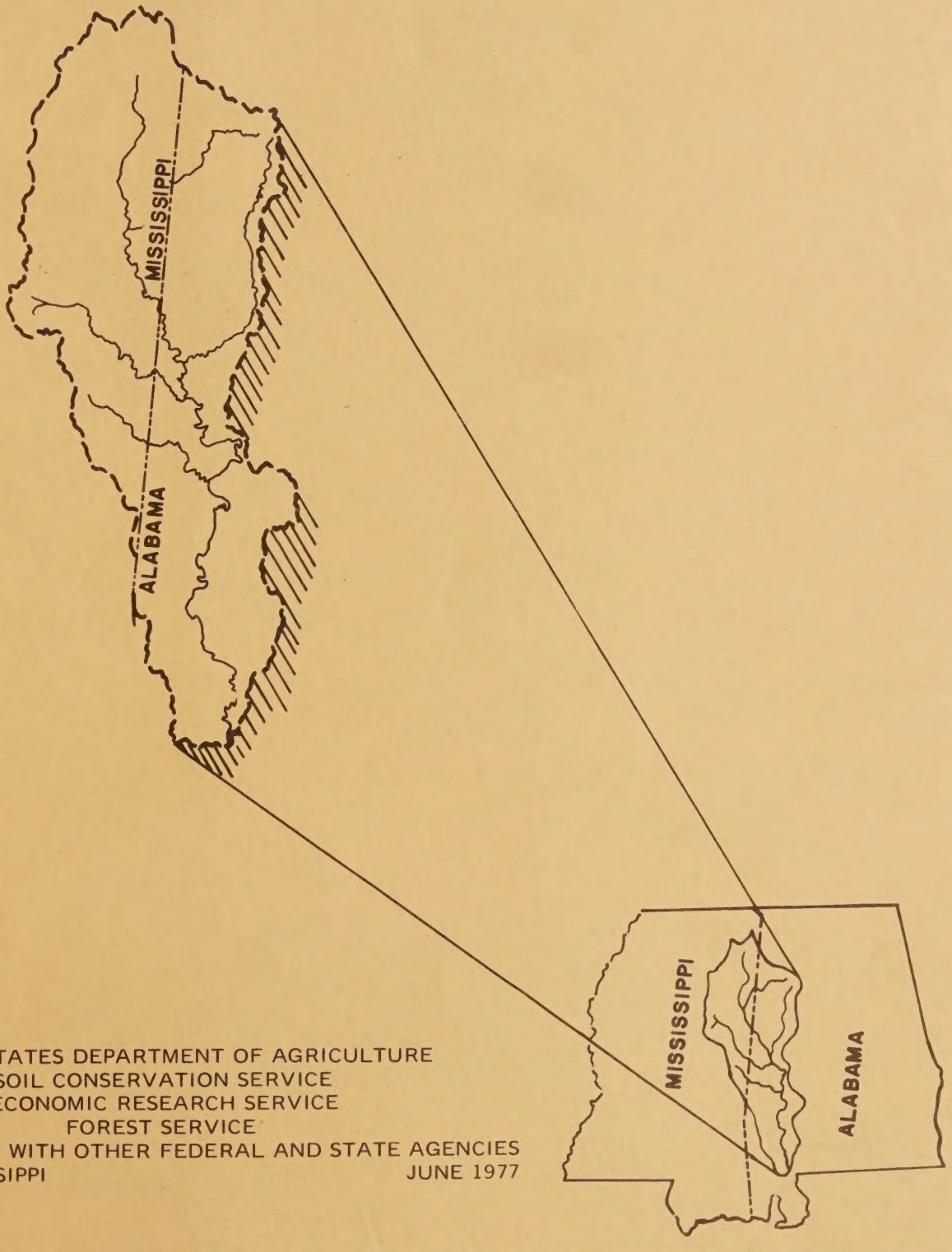
TOMBIGBEE RIVER BASIN

ALABAMA AND MISSISSIPPI

WATER AND RELATED LAND RESOURCES



UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ECONOMIC RESEARCH SERVICE
FOREST SERVICE
IN COOPERATION WITH OTHER FEDERAL AND STATE AGENCIES
JACKSON, MISSISSIPPI
JUNE 1977

TOMBIGBEE RIVER BASIN
ALABAMA AND MISSISSIPPI
WATER AND RELATED LAND RESOURCES

USDA Report

June 1977

Based On a Cooperative Survey By The
Alabama Development Office
Mississippi Board of Water Commissioners
And
United States Department of Agriculture

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CHAPTER I

SUMMARY

Purpose

The purpose of the study was to formulate alternative plans and suggest an alternative for use in facilitating the coordinated and orderly conservation, development, utilization, and management of the water and related land resources of the basin. Achievement of this purpose required an assessment of the water and related land resource problems, needs, and development potentials of the basin.

The Alabama Development Office and the Mississippi Board of Water Commissioners, in cooperation with other State and Federal agencies, are continuing a long-range program to obtain river basin resource data. This information can be used to effectively administer and assist in planning water management and land use in Alabama and Mississippi.

The United States Department of Agriculture (USDA) needs information about opportunities for development of water and related land use in subbasins as a basis for assisting local organizations in the development of those resources under the provisions of the Watershed Protection and Flood Prevention Act as well as other USDA programs.

The basin was studied by USDA during the period 1961 to 1963. The current study was undertaken in part because of the present emphasis on multiple-objective planning having national, regional, and environmental implications. Study objectives associated with the earlier study were limited in scope and did not specifically consider the environment.

A major concern for updating the study was the authorization of the Tennessee-Tombigbee Waterway. The construction of the waterway presents problems regarding outlets for potential upstream watershed projects. Ten locks and dams are proposed to provide slack water navigation from Demopolis, Alabama to the Tennessee River. The potential sediment deposition behind these dams is of major concern since the deposition increases operation and maintenance costs and may jeopardize the life of the project.

Authority

The Department of Agriculture participated in this study under authority of Section 6 of the Watershed Protection and Flood Prevention Act of the 83rd Congress (Public Law 566, as amended). This legislation authorizes the Secretary of Agriculture to cooperate with other Federal, State, and local agencies in their investigations of watersheds, rivers, and other waterways to develop coordinated programs.

Participants

The principal participants within the U.S. Department of Agriculture were the Soil Conservation Service, the Economic Research Service, and the Forest Service. The personnel assigned to the River Basin Staff by the three USDA agencies functioned as a planning team under the guidance of the Field Advisory Committee. Each agency had leadership responsibilities for designated aspects of the study.

The study was sponsored by the Alabama Development Office and the Mississippi Board of Water Commissioners.

Location and Size

The Tombigbee River Basin is part of a sub-region of the South Atlantic-Gulf Region. The basin is located in Western Alabama and Northeastern Mississippi. It comprises all or part of 16 counties in Alabama and 19 counties in Mississippi. The boundary encompasses 8.8 million acres of land and water, with 4.9 million acres in Alabama and 3.9 million acres in Mississippi. It is approximately 85 miles wide and 260 miles long.

The basin consists of the drainage area of the Tombigbee River above the confluence with the Alabama River, except for the drainage area of the Black Warrior River that flows into the Tombigbee River near Demopolis, Alabama. The eastern boundary is the divide of the Alabama and Black Warrior Rivers. The Tennessee and Hatchie River Systems make up the northern boundary. The western boundary consists of the divides of the Tallahatchie, Yalobusha, Big Black, Pearl, Chickasawhay, and Escatawpa Rivers.

Economy

There were approximately 456.6 thousand persons residing in the basin in 1970. Basin population peaked at 524.0 thousand in 1940 and it has been declining since then. The population decline is forecast to bottom out in the '70's--increase to 557.0 thousand in 1990 and to 717.0 thousand in 2020.

In 1940, the year in which the population was greatest, approximately 51.5 percent of total employment was in the agricultural industry, 16.1 percent in services, 14.3 percent in manufacturing, and the remainder in other industries. Agriculture retained its employment supremacy through the year 1950. Between 1950 and 1960, employment in manufacturing, services, and wholesale and retail trade surpassed that in agriculture. The trend is projected to continue into the future. By the year 2020, employment in services, manufacturing, and wholesale and retail trade will account for approximately 74 percent of total employment and agriculture only 3 percent. Thus, the data suggests that as the economy becomes more diversified and provides more employment opportunities, the population should increase as projected.

Per capita income is low in the basin. In 1970, the average per capita income was $2,469, or only 67 percent of the U.S. average. Per capita income, in terms of 1967 dollars, is projected to increase to $3,400 in 1980, and to $11,700 in 2020. If population and employment expand at the projected rate, a total personal income of $8.4 billion should be reached by 2020.

Problems and Objectives

Flooding is a major problem in the basin. Most damages are sustained by the agricultural sector--crops, pastures, and on-farm fixed improvements. There are 2.1 million acres of land subject to flooding. Of this amount, 673.2 thousand acres are along the principal streams and 1.4 million acres are in upstream watersheds. The total annual damages are estimated at $17.4 million. Of this amount, $11.9 million occur in upstream watersheds and $5.5 million along the principal streams.

Spring and summer floods delay land preparation, planting, cultivation, and alter management decisions. Floods that occur after the normal planting season make repreparation and replanting necessary. The results are often uneven stands, reduced crop yields, increased cost of production, and sometimes complete crop losses.

Agricutlural drainage is a problem since many acres of crops and pasture are on soils with a wetness hazard. Wetness is a problem on 926.5 thousand acres of land. Cropland totals 502.1 thousand acres and pastureland totals 424.4 thousand acres.

Where wetness hazards exist, reduced yields generally result. Wet conditions cause late planting, less frequent cultivation, and poor harvesting conditions, among other factors.

Some of the problems in the basin arise from improper land management and the resulting reduced yields. Low productivity on forestland is a major forestry problem. Improved management systems through proper land

use, contour farming, crop rotations, cover crops, crop residue management, no till, minimum tillage, terracing, grassed waterways, pasture planting and management, tree planting and woodland management would reduce erosion, decrease sediment yields, maintain soil productivity, increase yields, and decrease production costs. Sediment from uncontrolled erosion ultimately clogs drainage field ditches and drop inlet pipes. Also, sediment is deposited in channels, navigable waterways, and harbors. Often on-farm drainage systems are not adequately maintained. This impedes drainage and increases the risk from flooding. In turn, this causes reduced crop yields and increased production costs.

Improper land use is conducive to erosion and sub-marginal returns. Approximately 125.1 thousand acres of upland presently used for cropland should be in pasture or forest because of excessive slope and soil. Also, there is some land in pasture that should be in woodland because of soil and excessive slope.

Erosion is a major problem and is occurring on areas at rates that are classed as critical. Erosion in excessive amounts causes damages to the land resource. Where critical erosion occurs, land is lost, voided, or reduced yields result. Productive land changes to gullies or to channel use in extreme cases and to less intensive use in other cases.

Critical erosion problems follow: gullies, 31.1 thousand acres; roadbanks, 12.2 thousand acres; strip mines, 18.8 thousand acres; streambanks, 763 miles; cropland, 94.7 thousand acres; pastureland, 113.8 thousand acres; and forestland, 77.5 thousand acres.

An inadequate management system exists on 373.1 thousand acres of cropland, 453.8 thousand acres of pastureland, and 2.3 million acres of forestland. This problem usually results in reduced yields, increased erosion, and a less valuable land base.

A sediment yield was determined for nine sub-basins at their confluence with the Tombigbee River. The sum of the yields does not represent the yield at the outlet of the basin. Basinwide, this average annual sediment yield is 1.6 tons per acre. The average annual gross erosion rate for the basin is 7.7 tons per acre.

Sediment is transported by water and causes numerous problems. Suspended sediment decreases the water's visual quality and its value for recreation. It is also detrimental to biologic and aquatic life systems supported by water. Sediment is a deterrent to recreation in water stored for recreation use or when deposited on parks and playgrounds.

Sedimentation, as well as channel bed movement, is a constant threat to navigation and requires regular monitoring and maintenance in navigation channels. Excessive deposition fills waterways and increases flood hazards.

Production and processing of agricultural products often result in problems that affect the quality of water, land, and other resources. Problem analysis focused on the use of insecticides and plant nutrients by farmers and animal waste production associated with livestock and poultry enterprises. Based on the crops produced in the basin, it was concluded that insecticide use by farmers does not pose a major pollution problem.

Plant nutrients--nitrogen and phosphorous--use investigations were limited to the nitrate content of drinking water and the quantity of phosphorous leaving agricultural lands. As the result, the very low concentrations of nitrates found in ground water revealed that nitrogen does not presently pose a pollution problem to ground water. The investigation of phosphorous revealed that data is not available to determine if this element is a problem to surface water. Therefore, a definitive problem relating to plant nutrients was not established.

Animal waste is not now considered a major pollution problem. However, localized problems do occur. Since the technical knowledge is available to solve the potential water pollution from confined and/or partial confined animals, animal waste systems were analyzed. The pollution potential from farm animals is considered to be proportionate to the degree of confinement and the waste management system applied. These and other factors were analyzed and the pollution potential determined.

Effective control of animal waste may place a financial burden on some farmers. Preliminary cost estimates, for installation and maintenance of systems, are such that marginal farmers cannot defray such costs and maintain a profit margin.

Recreational needs were determined and based on the demand and supply of water, land, and facilities for selected recreation activities. These activities include swimming, picnicking, water skiing, boating, hiking, and camping. The demand for swimming, picnicking, camping, and skiing exceeds supply of resources--land, water, and facilities. The supply of resources is greater than the demand generated for boating and hiking.

Fish and wildlife problems as they relate to fishing and hunting were determined and based on the demand versus supply of habitat and harvestable species. Fishing waters are abundant and present no real problems. Resources associated with hunting are adequate to satisfy current demand; however, shortages will occur in future years.

Environmental problems are considered those relative to enhancement of environmental quality by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems. Problems, previously addressed, were determined and quantified to include the interrelationships of environmental factors--improvement of water quality, reduced

gully and roadside erosion, reduced sediment damage, reduced agricultural pollution, and enhancement of fish and wildlife habitat. In addition, consideration was given to the preservation of environmental features--namely, preservation of natural and scenic areas, ecological communities, archaeological sites, and historic sites.

The problems of the basin resulted in study concerns. As required by the Principles and Standards, study concerns were translated into specific components of two objectives--National Economic Development (NED) and Environmental Quality (EQ). The specific components were identified with one of the objectives and further listed in terms of first level and second level outputs (table 1.1).

Needs

Needs were identified for the NED and EQ objectives. These needs reflect the desires as interpreted from study concerns. The needs are obtainable from a physical standpoint and are also practical and reasonable. However, solutions may be limited by existing authorities and in some cases new legislation may be required. Component needs for the NED and EQ objectives are summarized in tables 1.2 and 1.3, respectively.

Suggested Plan

Major suggested plan elements, effects, and program opportunties are summarized in table 1.4. Data are presented for each sub-basin and totaled for the basin; also, the plan effects are displayed for the National Economic Development, Environmental Quality, Regional Development, and Social Well-Being Accounts. Program opportunities--USDA and other--are identified.

Structures, measures, and facilities proposed for installation in the early action plan--by year 1990--are estimated to cost $201.7 million. Flood damage reduction plan elements total $53.1 million, land treatment plan elements total $127.2 million, recreation plan elements total $7.2 million, animal waste treatment units total $2.8 million, and preservation of environmental sites total $11.4 million.

The early action plan average annual costs are $31.0 million. Average annual benefits total $4.4 million for flood damage reduction and $4.6 million for recreation sites. Benefits for other components were not evaluated.

Structures, measures, and facilities proposed for installation in the long-range plan--by year 2020 and inclusive of 1990 costs--are estimated to cost $242.4 million. Flood damage reduction plan elements total

Table 1.1. Problems and objectives summary, Tombigbee River Basin

Primary objectives	Problems (public concerns)	Specific components of the objectives	
		First level	Second level
National Economic Development	1. Frequent flooding in upstream watersheds on 1.4 million acres of land.	Increased or more efficient output of food and fiber.	1. Reduce frequency of flooding in the upstream watersheds and increase the acres of flood free land.
	2. Wetness hazards on 502,100 cropland acres and 424,372 pastureland acres result in reduced yields.		2. Provide for adequate drainage on cropland and pastureland.
	3. Present management and land use results in excessive erosion on cropland, pastureland, and forestland and increases production costs and damage to the land resource base. (3.1 million acres)		3. Provide for improved technology and proper conservation practices for cropland, pastureland, and forestland.
	4. Critical erosion from gullies and streambanks, as well as from steep cropland, pastureland, and some forestland damages the land resource base. (348.1 thousand acres)		4. Provide for proper treatment to critical areas.
	1. Inadequate recreation facilities to meet activity occasion needs.	Increased or more efficient output of recreational services.	1. Provide recreation facilities and recreation opportunities.
	2. Sediment yields reduce the quality of water for recreation purposes. (14.3 million tons annually)		2. Provide for erosion and sediment control.
	3. Use of insecticides and plant nutrients and the animal waste pollution potential affects water quality		3. Provide for proper use of insecticides and fertilizers and the proper treatment of animal wastes.
Environmental Quality	1. Improper management of natural areas reduces overall environmental quality.	Preserve the natural aesthetic and scenic features of the basin.	1. Provide for identification and proper management of these scenic features.
	1. Critical erosion from gullies and roadbanks throughout the basin affect water quality and the land base.	Improved quality of water and land resources.	1. Provide for erosion control and sediment control.
	2. Use of insecticides and plant nutrients and animal wastes pollution potential affects water quality of streams and lakes.		2. Provide for proper use of insecticides and fertilizers and the proper treatment of animal wastes.
	1. Adequate land and water resources for proper management of fish and wildlife resources.	Improve quality of biological resources and ecosystems.	1. Provide for proper management of these resources.
	1. Loss of or improper use of the historical values of the basin.	Preserve the archaeological and historical values of the basin.	1. Provide for identification and proper management of these values.

Table 1.2. National economic development objective component needs, Tombigbee River Basin, 1970 and projected 1990 and 2020

Component need	Unit	Year		
		1970	1990	2020
		Thou.	Thou.	Thou.
Flood damage reduction	Acres	690.6	690.6	690.6
	Dollars	7,873.7	10,235.7	14,960.1
Wetness hazard damage reduction:				
Cropland	Acres	502.1	553.3	586.8
Pastureland	Acres	424.4	418.3	360.8
Erosion damage reduction				
Critical areas				
Cropland	Acres	94.7	76.0	66.5
Pastureland	Acres	113.8	111.8	111.8
Forestland	Acres	77.5	77.5	77.5
Gully	Acres	31.1	27.9	27.9
Streambank	Miles 1/	763.0	763.0	763.0
Strip mine	Acres	18.8	18.8	18.8
Management systems				
Other areas				
Cropland	Acres	373.1	401.1	426.6
Pastureland	Acres	453.8	415.9	372.3
Forestland	Acres	2,308.4	2,268.2	2,268.2
Land				
Cropland	Acres	1,272.9	1,272.7	1,330.5
Pastureland	Acres	1,278.4	1,321.3	1,220.2
Forestland	Acres	5,785.3	5,665.0	5,635.0
Recreation				
Swimming beaches	Activity occasions	1,062.9	1,380.0	1,855.6
Picnicking	Activity occasions	1,089.7	1,691.5	2,608.2
Camping	Activity occasions	338.3	465.1	618.0
Hunting	Man-days	0.0	0.0	391.5

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Miles, not in thousands.

Table 1.3. Environmental quality objective component needs, Tombigbee River Basin, 1970 and projected 1990 and 2020

Component need	Unit	Year		
		1970	1990	2020
Erosion damage reduction				
Gully	Thousand acres	31.1	27.9	27.9
Strip mine	Thousand acres	18.8	18.8	18.8
Streambank	Miles	763.0	763.0	763.0
Roadside	Thousand acres	12.2	10.8	10.8
Sediment yield reduction from sub-basins	Thousand tons	14,293.0	13,266.0	13,562.0
Animal waste treatment units	Number	393	552	594
Preserve environmental elements				
Natural and scenic areas	Number	50	57	64
Ecological areas	Number	2	6	6
Archaeological sites	Number	419	452	484
Historical sites	Number	253	31	36

Source: River Basin Survey Staff, United States Department of Agriculture.

Table 1.4. Summary display of plan elements, effects and program opportunities, suggested early action plan, Tombigbee River Basin, 1990

Plan elements	Suggested plan effects					Program opportunities	
	National Economic Development		Environmental Quality	Regional Development		Social Well Being	USDA-Program opportunities [1/]	Other program opportunities [1/]
	Beneficial effects ($1,000)	Adverse effects ($1,000)	Beneficial and adverse effects	Beneficial effects	Adverse effects	Beneficial and adverse effects		
Sub-basin 34 Upper - totals								
Land treatment			1. Create lakes - 3,010 surface acres.	1. Income ($1,000)		1. Create 466 low to medium income permanent jobs.	1. PL-566 Watershed Projects	1. State Forestry Programs
Wetness hazard damage reduction - 124,560 ac.			2. Reduce erosion on 438,700 ac.	2,115.5	565.2	2. Reduce flood damages on 71,900 acres.	2. RC&D Projects	2. State Fish and Game Commissions
Management systems - other areas - 388,400 ac.	1,696.8	1,242.5	3. Loss of bottomland hardwoods due to dams and channels - 3,182 ac.	Net beneficial effects - 1,550.3		3. Recreation - 536,500 visitor-days.	3. FmHA Loans	
Channels - 152 mi.	Net beneficial effects-		4. Reduce flood damages on 71,900 ac.	2. Employment			4. PL-46	3. Planning and Development Districts
Dams FP - 55	454.3		5. Conversion of land to water - 3,010 ac.	434 permanent semi-skilled jobs.			5. ACP	4. Drainage Districts
Critical area treatment - 50,300 ac.				319 man-years of labor in construction.			6. USFS - State and Private	5. Water Management Districts
							7. Flood Hazard Studies	6. Soil and Water Conservation Districts
Sub-basin 34 Lower - totals								7. Corps of Engineers
Land treatment			1. Create lakes - 175 surface acres.	1. Income ($1,000)		1. Create 145 low to medium income permanent jobs.		8. Bureau of Outdoor Recreation
Wetness hazard damage reduction - 135,280 ac.			2. Reduce erosion on 860,000 acres.	841.9	244.6	2. Reduce flood damages on 4,100 acres.		9. U. S. Fish and Wildlife Service
Management systems - other areas - 824,800 ac.	661.5	366.4	3. Loss of bottomland hardwoods due to dams and channels - 83 ac.	Net beneficial effects - 597.3		3. Recreation - 366,000 visitor-days.		10. Environmental Protection Agency
Dams FP - 5	Net beneficial effects-		4. Reduce flood damages on 4,100 ac.	2. Employment				
Critical area treatment - 35,200 ac.	295.1		5. Conversion of land to water - 175 ac.	145 permanent semi-skilled jobs.				
				52 man-years of labor in construction.				
Sub-basin 34a - totals								
Land treatment			1. Create lakes - 2,290 surface acres.	1. Income ($1,000)		1. Create 417 low to medium income permanent jobs.		
Wetness hazard damage reduction - 103,040 ac.			2. Reduce erosion on 267,300 ac.	1,666.3	428.4	2. Reduce flood damages on 74,600 acres.		
Management systems - other areas - 238,400 ac.	1,409.4	1,020.8	3. Loss of bottomland hardwoods due to dams and channels - 1,851 ac.	Net beneficial effects - 1,237.9		3. Recreation - 291,000 visitor-days.	[1/] Applicable to all sub-basins.	[1/] Applicable to all sub-basins.
Channels - 118 mi.	Net beneficial effects-		4. Reduce flood damages on 74,600 ac.	2. Employment				
Dams FP - 68	388.6		5. Conversion of land to water - 2,290 ac.	571 permanent semi-skilled jobs.				
Critical area treatment - 28,900 ac.				411 man-years of labor in construction.				
Sub-basin 34b - totals								
Land treatment			1. Create lakes - 600 surface acres.	1. Income ($1,000)		1. Create 130 low to medium income permanent jobs.		
Wetness hazard damage reduction - 129,355 ac.			2. Reduce erosion on 162,100 ac.	545.7	148.3	2. Reduce flood damages on 17,300 ac.		
Management systems - other areas - 129,300 ac.	465.2	309.5	3. Loss of bottomland hardwoods due to dams and channels - 180 ac.	Net beneficial effects - 397.4		3. Recreation - 125,200 visitor-days.		
Channels - 52 mi.	Net beneficial effects-		4. Reduce flood damages on 17,300 ac.	2. Employment				
Dams - 17	155.7		5. Conversion of land to water - 600 ac.	123 permanent semi-skilled jobs.				
Critical area treatment - 32,800 ac.				71 man-years of labor in construction.				
Sub-basin 34c - totals								
Land treatment			1. Reduce erosion on 241,900 acres.	1. Income ($1,000)		1. Create 45 low to medium income permanent jobs.		
Wetness hazard damage reduction - 31,662 ac.				292.7	92.5	2. Recreation - 146,900 visitor-days.		
Management systems - other areas - 225,600 ac.	227.1	117.0		Net beneficial effects - 200.2				
Critical area treatment - 16,300 ac.	Net beneficial effects-			2. Employment				
	110.1			45 permanent semi-skilled jobs.				
				11 man-years of labor in construction.				

Continued --

Table 1.4. Summary display of plan elements, effects and program opportunities, suggested early action plan, Tombigbee River Basin 1990 (continued)

Plan elements	Suggested plan effects				Program opportunities	
	National Economic Development	Environmental Quality	Regional Development	Social Well Being	USDA-Program opportunities 1/	Other program opportunities 1/
	Beneficial effects ($1,000) / Adverse effects ($1,000)	Beneficial and adverse effects	Beneficial effects / Adverse effects	Beneficial and adverse effects		
Sub-basin 34d - totals						
Land treatment		1. Create lakes - 1,475 surface acres.	1. Income ($1,000) 1,215.7 / 272.2	1. Create 287 low to medium income permanent jobs.	1. PL-566 Watershed Projects	1. State Forestry Programs
Wetness hazard damage reduction - 98,911 ac.	980.4 / 650.8	2. Reduce erosion on 117,500 ac.	Net beneficial effects - 943.5	2. Reduce flood damages on 47,300 acres.	2. RC&D Projects	2. State Fish and Game Commissions
Management systems - other areas - 75,000 ac.	Net beneficial effects - 329.6	3. Loss of bottomland hardwoods due to dams and channels - 507 ac.	2. Employment 269 permanent semi-skilled jobs.	3. Recreation - 244,700 visitor-days.	3. FmHA Loans	
Channels - 89 mi.			163 man-years of labor in construction.		4. PL-46	3. Planning and Development Districts
Dams - 31		4. Reduce flood damages on 47,300 ac.			5. ACP	4. Drainage Districts
Critical area treatment 42,500 ac.		5. Conversion of land to water - 1,475 ac.			6. USFS - State and Private	5. Water Management Districts
Sub-basin 34e - totals					7. Flood Hazard Studies	
Land treatment		1. Reduce erosion on 234,300 ac.	1. Income ($1,000) 274.0 / 74.3	1. Create 41 low to medium income permanent jobs.		6. Soil and Water Conservation Districts
Wetness hazard damage reduction - 28,400 ac.	214.7 / 94.0		Net beneficial effects - 199.7	2. Recreation - 139,500 visitor-days.		7. Corps of Engineers
Management systems - other areas - 218,900 ac.	Net beneficial effects - 120.7		2. Employment 41 permanent semi-skilled jobs.			8. Bureau of Outdoor Recreation
Critical area treatment - 15,400 ac.			15 man-years of labor in construction.			9. U. S. Fish and Wildlife Service
Sub-basin 34f - totals						10. Environmental Protection Agency
Land treatment		1. Create lakes - 3,600 surface acres.	1. Income ($1,000) 1,725.7 / 414.9	1. Create 402 low to medium income permanent jobs.		
Wetness hazard damage reduction - 95,616 ac.	1,398.1 / 1,039.2	2. Reduce erosion on 222,000 ac.	Net beneficial effects - 1,310.8	2. Reduce flood damages on 75,500 ac.		
Management systems - other areas - 181,300 ac.	Net beneficial effects - 358.9	3. Loss of bottomland hardwoods due to dams and channels - 3,050 ac.	2. Employment 371 permanent semi-skilled jobs.	3. Recreation - 358,200 visitor-days.	1/ Applicable to all sub-basins.	1/ Applicable to all sub-basins.
Channels - 131 mi.			276 man-years of labor in construction.			
Dams 49		4. Reduce flood damages on 75,500 ac.				
Critical area treatment - 40,700 ac.		5. Conversion of land to water - 3,600 ac.				
Sub-basin 34h - totals						
Land treatment		1. Create lakes - 250 surface acres.	1. Income ($1,000) 375.1 / 113.0	1. Create 67 low to medium income permanent jobs.		
Wetness hazard damage reduction - 30,480 ac.	295.0 / 184.5	2. Reduce erosion on 207,200 ac.	Net beneficial effects - 262.1	2. Reduce flood damages on 4,100 ac.		
Management systems - other areas - 186,600 ac.	Net beneficial effects - 110.5	3. Loss of bottomland hardwoods due to dams and channels - 250 ac.	2. Employment 65 permanent semi-skilled jobs.	3. Recreation - 152,100 visitor-days.		
Channels - [illegible] mi.			32 man-years of labor in construction.			
Dams - 6		4. Reduce flood damages on 4,100 ac.				
Critical area treatment - 20,600 ac.		5. Conversion of land to water - 250 ac.				
Basin totals						
Land treatment		1. Create lakes - 11,400 surface acres.	1. Income ($1,000) 9,052.6 / 2,353.4	1. Create 2,000 low to medium income permanent jobs.		
Wetness hazard damage reduction - 777,304 ac.	7,348.2 / 5,024.7	2. Reduce erosion on 2,751,000 ac.	Net beneficial effects - 6,699.2	2. Reduce flood damages on 294,800 ac.		
Management systems - other areas -2,468,300 ac.	Net beneficial effects - 2,323.5	3. Loss of bottomland hardwoods due to dams and channels - 9,103 ac.	2. Employment 1,877 permanent semi-skilled jobs.	3. Recreation - 2,360,100 visitor-days.		
Channels - 550 mi			1,906 man-years of labor in construction.			
Dams - 231		4. Reduce flood damages on 294,800 ac.				
Critical area treatment - 282,700 ac.		5. Conversion of land to water - 11,400 ac.				

Source: River Basin Survey Staff, United States Department of Agriculture.

$78.2 million, land treatment plan elements total $128.5 million, recreation plan elements total $14.2 million, animal waste treatment units total $3.0 million, and preservation of environmental sites total $18.5 million.

The long-range plan average annual costs are $36.5 million. Average annual benefits total $5.9 million for flood damage reduction and $9.0 million for recreation. Benefits for other components were not evaluated.

CHAPTER II

INTRODUCTION

The Alabama Development Office and the Mississippi Board of Water Commissioners, in cooperation with other State and Federal agencies, are continuing a long-range program to obtain river basin data. This information can be used to effectively administer and assist in planning water management and land use in Alabama and Mississippi. The U.S. Department of Agriculture needs information about opportunities for development of water and related land use in sub-basins as a basis for assisting local organizations in the development of those resources under the provisions of the Watershed Protection and Flood Prevention Act (PL-566), as well as other USDA programs.

The Tombigbee River Basin was studied in 1961-63. A second study was undertaken in part because of the current emphasis on multiple-objective planning with national, regional, and environmental implications. Study objectives associated with the earlier study were more limited in scope and did not specifically consider environmental impacts. This restudy, to the extent possible, is in accordance with the Water Resources Council's (WRC) Principles and Standards. Other reasons for updating the study are:

1. Creation of the Tombigbee River Valley Water Management District with financial and legislative authority to plan, develop, conserve and manage water and land resources in the basin.

2. Creation of the Tombigbee Valley Development Authority in Alabama, with authority to engage in works of internal improvement associated with the construction and maintenance of a navigable waterway.

3. U.S. Army Corps of Engineers restudy of the Tombigbee River and Tributaries to determine the need for additional projects or enlargement of presently authorized projects for flood prevention and other purposes.

4. Authorization of the Tennessee-Tombigbee Waterway--the authorization of the waterway presents problems regarding outlets for potential upstream watershed projects. Ten locks and dams are proposed to provide slack water navigation from Demopolis, Alabama to the Tennessee River. The potential sediment deposition behind these dams is of concern to agencies since the deposition increases operation and maintenance costs and jeopardizes the life of the project.

5. Increased importance of recreation, fish and wildlife habitat, and pollution.

Authority

The Department of Agriculture participated in this study under authority of Section 6 of the Watershed Protection and Flood Prevention Act of the 83rd Congress (Public Law 566, as amended). This legislation authorizes the Secretary of Agriculture to cooperate with other Federal, State, and local agencies in their investigation of watersheds, rivers, and other waterways to develop coordinated programs. The study was sponsored by the Alabama Development Office and the Mississippi Board of Water Commissioners.

Purpose

The purpose of the study was to formulate a plan(s) for use in facilitating the coordinated and orderly conservation, development, utilization, and management of the water and related land resources of the basin. Achievement of this purpose required an appraisal of the water and related land resource problems, needs, and development potentials of the basin and included the following:

1. An inventory of resources.

2. An assessment of the environmental conditions.

3. Historical review and projections of economic changes.

4. Translation of projections into needs for water and related land resources.

5. Appraisals of the availability of land resources.

6. A description of the present and future problems and the general approaches for their appropriate solution.

7. Formulation of a multi-objective plan for the orderly development of water and related land resources of the basin.

8. Identification of projects which need to be initiated during the next 10 to 25 years.

9. Studies to determine the extent to which flood control, sediment reduction, drainage, recreation, fish and wildlife habitat improvement, and water quality control can be provided by existing resource development programs.

10. A compilation of economic, hydrologic, engineering, environmental and related data to assist the States of Alabama and Mississippi and local groups in planning the wise use of natural resources commensurate with the desires of basin residents.

Basin Location

The universe is the drainage basin of the Tombigbee River, except for the Black Warrior River, above its confluence with the Alabama River. The basin encompasses an area of approximately 13,762 square miles and is about 85 miles wide and 260 miles long. It comprises all or part of 19 counties in Eastern Mississippi and 16 counties in Western Alabama. Approximately 4.9 million acres are in Alabama and the remaining 3.9 million acres are in Mississippi. The basin is bounded on the west by the Escatawpa, Chickasawhay, Pearl, Big Black, Yalobusha, Yocona, and Tallahatchie River systems; on the north by the Tennessee and Hatchie; and on the east by the Warrior and Alabama River systems. The principal rivers and creeks are the east and west forks of the Tombigbee, Bull Mountain, Buttahatchie, Tibbee, Luxapalila, Noxubee, Sipsey, Sucarnoochee, Chickasaw Bogue, Satilpa, Bassets, Santa Bogue, and Bilbo.

Participants

The principal participants within the U.S. Department of Agriculture were the Soil Conservation Service, the Economic Research Service, and the Forest Service. The personnel assigned to the River Basin Survey Staff by the three USDA agencies functioned as a planning team under the guidance of the Field Advisory Committee. Each agency had leadership responsibilities for designated aspects of the study as outlined in an adopted plan of work.

Participation of the USDA agencies was carried out in accordance with assigned responsibilities and coordinated through the Field Advisory Committee. The Committee members maintained appropriate liaison with administratively responsible officers of their respective services in carrying out this survey. The Committee also maintained liaison with the sponsors to assure coordination of the planning activities.

The sponsors, Alabama Development Office and Mississippi Board of Water Commissioners, contributed to the study. The sponsors assisted in preparing the plan of work that set forth the objectives of the study. Sponsor representatives attended some of the quarterly Field Advisory meetings and expressed their views. Also, the sponsors assisted by securing basic data from other state and local agencies. Further, the sponsors aided in developing the study concerns and in establishing the specific components of the two objectives of the study. The sponsors transmitted draft copies of the report to other state and local agencies for their review and comments in addition to making their own review and comments. The reviews and comments received on the draft reports resulted in changes in the final report.

Nature, Scope, and Intensity of Investigations

The study was limited to investigations necessary to establish the general type, size, location, and priority of measures needed to accomplish

flood control and prevention in upstream watersheds, improve impaired drainage of selected agricultural lands, improve forestry production, reduce sedimentation and erosion, provide for adequate recreational facilities, protect and enhance fish and wildlife resources, and maintain or improve the environmental quality of the basin. Secondary data and other information were used whenever possible and available. The study was comprehensive only to the extent that major purposes of water and related land resource developments were considered. The study results emphasize solutions to problems that can be implemented by U.S. Department of Agriculture programs. However, the report contains recommendations concerning additional needs that will have to be met by other programs. Economic development was considered only to the extent necessary to determine the proper role for water and related lands.

Potential solutions to water and related land problems include structural and non-structural measures. Project and non-project type action was considered. Individual watershed projects found to be needed and economically feasible under present criteria were identified. Their sizes, purposes, and cost-sharing arrangements are compatible with projects planned and installed through Public Law 566.

Delineation of Basin Subareas

For the purpose of identifying flood problems, sediment problems, existing watershed projects and certain other elements, the basin was subdivided into nine areas, referred to as sub-basins. The Tombigbee River Basin, as classified in the 1963 "Atlas of River Basins of the United States," is designated as a part of basin number 34. The basin is a subregion of the South Atlantic-Gulf Region (Water Resources Council classification). Basin number 34 also includes the Black Warrior River in Alabama which is not a part of this study. Seven of the sub-basins of the Tombigbee are designated by subscripts in the Atlas. The other two sub-basins, referred to as 34 Upper and 34 Lower, are subdivisions of the basin that are not delineated in the Atlas.

A further subdivision of the sub-basins into watersheds was made. This division was based upon the Conservation Needs Inventory (CNI) delineation of individual watersheds. These watersheds are numbered consecutively by sub-basins, except in 34 Upper and 34 Lower sub-basins which have all of the watersheds in both numbered consecutively. Where an individual watershed extends into both Alabama and Mississippi, the watershed number in each state is not necessarily the same. Therefore, these watersheds may have two different numbers.

In order to properly identify the watersheds in the narrative and tables, further identification was made by having the letters A or M for Alabama and Mississippi included in the numbering system. Since some watersheds extend into both states, they are identified with two sets of

numbers and letters; e.g., in sub-basin 34a, Bull Mountain Creek Watershed is referred to as 34a - 1A and 2M.

There are 123 individual watersheds in the basin. Map 2.1 shows the Tombigbee River Basin, the nine sub-basins, and the individual watersheds. In the course of the investigation, it became evident that a combination of some of the watersheds would expedite the study. Therefore, 77 watersheds were formed into 25 watershed groups. The grouping was based upon the similarity of such factors as topography, land use, hydrologic conditions, location, and soils. The watershed groups are also shown on map 2.1.

In making some of the recreation evaluations and analyses, the basic data available were reported by planning and development organizations in Alabama and Mississippi. In Alabama, these organizations may be called councils or commissions. In Mississippi, they are called districts. Hereafter, such organizations are referred to as planning and development districts. The Tombigbee River Basin is in all or part of seven districts--three in Alabama and four in Mississippi. Data for these districts were utilized in this study and the problems, needs, and recreation plan elements were related to the areas encompassed by the districts. The boundaries of the planning and development districts are shown on map 2.2.

Relationship of Basin Subareas to Other Basin Designations

Other designated sub-basins and boundaries for the Tombigbee River Basin are available. The 1963 "Atlas of River Basins of the United States" prepared by USDA-SCS was revised in 1970. This revised edition changed the basin and sub-basin numbering system and although retaining, for the study area, the same number of sub-basins the delineations of the sub-basins are different.

Changes are noted below.

1. Six of the eight sub-basins retained their boundaries but were renumbered.

2. Luxapalila Creek was delineated as a sub-basin in the 1970 atlas and numbered 35a4(d). Previously it was part of sub-basin 34.

3. West Fork Tombigbee River, previously sub-basin 34b, was made a part of the Tombigbee sub-basin number 35a4.

The U.S. Geological Survey in cooperation with the U.S. Water Resources Council is preparing state hydrologic unit maps. Some of the maps are complete. These maps are based on the regions and sub-regions used for the 1975 National Water Assessment. The study area is included in the South

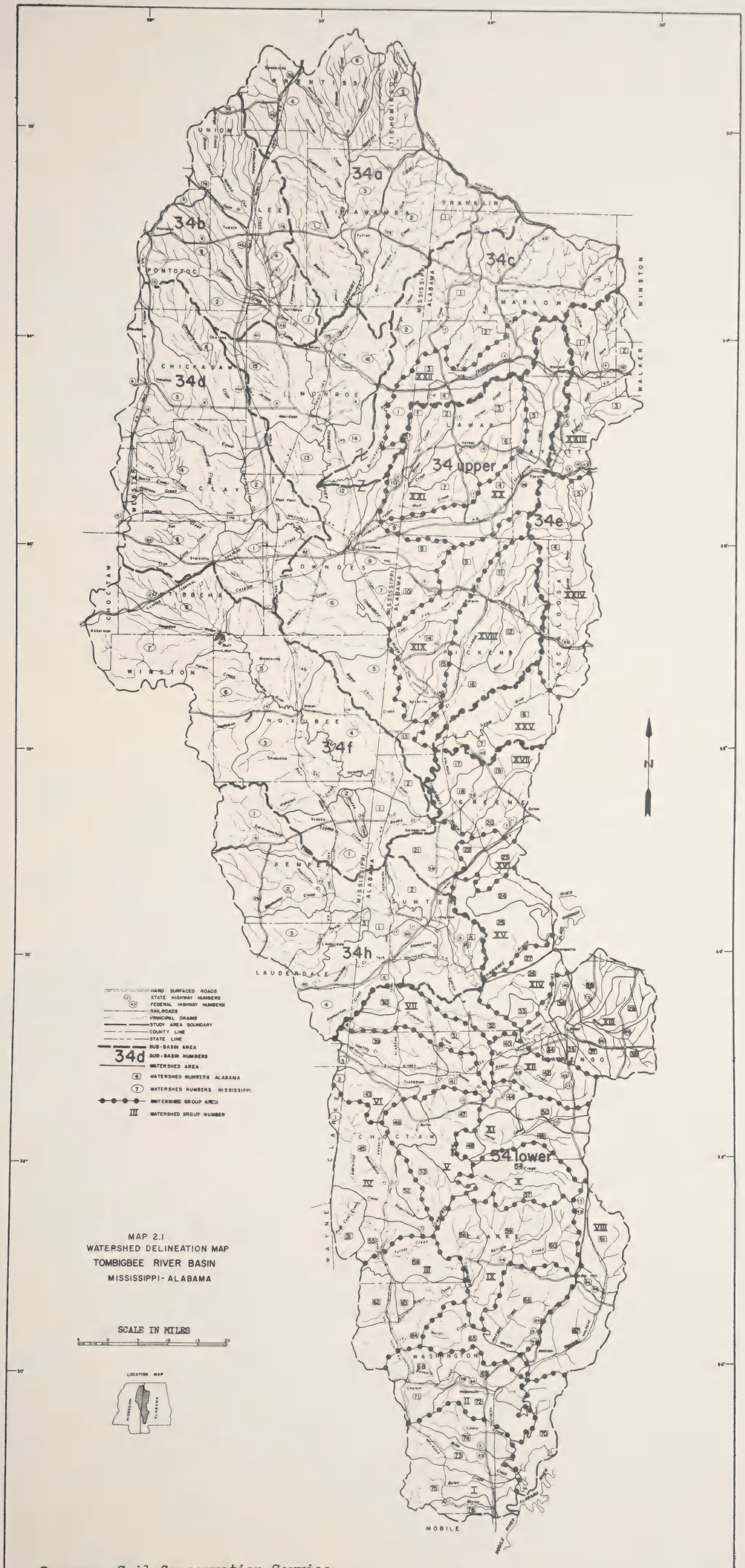
Atlantic-Gulf Region and is a part of the sub-region number 0316. Further, the sub-region is divided into cataloging units with boundaries that relate to sub-basin boundaries of the USDA-SCS Atlas.

The cataloging units and major stream names are shown below, along with the relationship to the sub-basins used for this study (map 2.1).

Cataloging Unit Number	Major Stream	Relationship to Sub-Basins of this Report
03160101	Tombigbee River above Columbus, MS.	Includes all of 34a and part of 34 Upper.
03160102	West Fork Tombigbee River	Same as 34b.
03160103	Buttahatchee River	Same as 34c.
03160104	Tibbee River	Same as 34d.
03160105	Luxapalila Creek	A part of 34 Upper.
03160106	Tombigbee River below Columbus, MS and above Demopolis, AL.	A part of 34 Upper and 34 Lower.
03160107	Sipsey River	Same as 34e.
03160108	Noxubee River	Same as 34f.
03160201	Tombigbee River below Demopolis, AL and above Jackson Lock and Dam.	A part of 34 Lower.
03160202	Sucarnoochee River	Same as 34h.
03160203	Tombigbee River below Jackson Lock and Dam and above Mobile River.	A part of 34 Lower.

Use That Can Be Made of Report

Information generated and presented in the suggested plan will be used by federal, state, and local planning groups for subsequent detailed water and related land resource planning and establishing priorities for expenditure of funds.



MAP 2.1
WATERSHED DELINEATION MAP
TOMBIGBEE RIVER BASIN
MISSISSIPPI - ALABAMA

Source: Soil Conservation Service,
United States Department of Agriculture

August, 1976

LEGEND

- Roads
- (17) State Highway Numbers
- (43) Federal Highway Numbers
- Railroads
- Principal Streams
- Study Area Boundary
- County Lines
- State Lines
- Planning and Development Districts or Commissions (PDD)
- Three Rivers — PDD Name
- 2 — PDD Number
- PDD Boundary

Source: Soil Conservation Service, United States Department of Agriculture

Map 2.2

PLANNING AND DEVELOPMENT DISTRICTS
TOMBIGBEE RIVER BASIN
MISSISSIPPI-ALABAMA

SCALE IN MILES

LOCATION MAP

August, 1976

CHAPTER III

PROBLEMS AND OBJECTIVES

Introduction

This study began early in 1970 and a Plan of Work and a Work Outline were developed shortly thereafter. These documents identified the problems of the basin and the objectives of the study. The Revised Plan of Work dated November 1971 and the Work Outline dated January 1973, provided for a study that would facilitate the coordinated and orderly conservation, development, utilization, and management of water and related land resources.

Problems Related to Economic Development

Flooding

Flooding is a major problem in the basin and occurs in upstream watersheds and along principal streams. The most frequent flooding generally occurs in the spring and winter months. However, local flooding may occur any time during the year, especially in the upstream watersheds. Most damages are sustained by the agricultural sector--crops, pastures, and on-farm fixed improvements. Roads, bridges, residences, business, urban, and industrial property are also subject to floodwater damages; however, to a lesser extent.

There are 2.1 million acres of land subject to flooding. This amounts to 24 percent of the land area. Of this amount, 673.2 thousand acres are along the principal streams and 1.4 million acres are in upstream watersheds. Land use on the floodplain land is 16 percent cropland, 20 percent pasture, 61 percent forest, and 3 percent other.

Total annual damages from flooding are estimated at $17.4 million. Of this amount, $11.9 million occur in the upstream watersheds and $5.5 million in the principal reaches. Monetary damages by type are as follows: crops and pasture, $10.6 million; on-farm improvements, $2.7 million; roads, bridges, and railroads, $1.9 million; urban, $1.1 million; and other, $1.1 million.

Agricultural Drainage

Agricultural drainage is a problem on many acres of crops and pasture that are on soils with a wetness hazard. Cropland with a wetness hazard

totals 502.1 thousand acres. Pastureland totals 424.4 thousand acres. Drainage of forestland is no problem.

Forest Resources

The major forestry problem is that of low productivity due largely to the presence of understocked stands and poor wood utilization after harvest. The result will be a roundwood demand-supply deficit in future years. The basin's 5.8 million acres of forestland consists of only 378 thousand acres that are well-stocked with desirable trees. The bulk of the area, 4.8 million acres, has fair stocking and the remaining 591 thousand acres are poorly stocked. Over three-fourths of the forestland is in private non-industrial ownership. On these lands, the net annual growth is about half that of industry and National Forest holdings.

Poor utilization after harvest is a factor contributing to the roundwood demand-supply deficit. This includes incomplete utilization of trees in the forest and at the mills.

A total of 157.2 million cubic feet of the forest resource is left in the woods after harvest. This is the equivalent of 27 cubic feet per acre annually. This volume is in stumps, tops, unused sections, and residual trees.

Waste occurs also when the products reach the mill. This amounts to approximately 42.7 million cubic feet. Nearly 65 percent consists of coarse residues (slabs, edgings, and cull pieces) and 35 percent consists of fines (sawdust and bark). Most of the waste material used is converted to chips for pulping.

Recreation Shortages

Six outdoor recreation activities were evaluated to determine recreation needs. Swimming had an unmet need of 2.5 million activity occasions; picnicking, 1.1 million; water skiing, 43.2 thousand; and camping, 129.4 thousand.

The needs for swimming, picnicking, and camping are not a reflection of shortages in recreation land or water but a shortage of developed facilities. There were no unmet needs for boating and hiking.

Fish and Wildlife Shortages

There is an adequate supply and distribution of game and fish in the basin for the present. Although present supplies of game for hunting are adequate, a shortage will develop by 2020.

Problems Related to Environmental Quality

Erosion and Sediment

Damages resulting from erosion occur throughout the basin. Soils with an erosion hazard total 4.2 million acres. Of this total, 2.0 million acres are in land capability subclass IIe through IVe and 2.2 million acres in subclasses VIe and VIIe. Many of the acres are adequately protected; however, 3.5 million acres need additional treatment and management systems.

The 3.5 million acres consists of 348.1 thousand acres of land with a critical problem. Also, 763 miles of streambanks are classed as having critical erosion problems. Critical problem areas include gullies, roadbanks, strip mines, streambanks, cropland, pastureland, and forestland. The remaining 3.1 million acres consists of cropland, pastureland, and forestland. Forestland acres disturbed by logging operations total 122.5 thousand, by site preparation practices 64.0 thousand, by wildfire 30.0 thousand, and by grazing 885.5 thousand.

Erosion rates range from less than 0.7 ton per acre for natural or geologic forestland erosion to more than 350 tons per acre average annually for critically eroding gullies. Cropland erosion rates range from less than 5.0 tons per acre (considered adequately treated) to more than 83.0 tons per acre average annually for continuously grown row crops on sloping highly erosive soils with improper farm management. Erosion rates for pastureland range from less than 1.0 ton per acre to more than 29.0 tons per acre average annually with poor management. Forestland average annual erosion rates range from 0.3 tons per acre to 6.5 tons per acre for areas disturbed by logging, wildfire and grazing and from 0.9 tons per acre to 17.5 tons per acre for areas disturbed by site preparation.

Gross erosion totals 67.5 million tons annually. Sheet erosion sources account for 63.8 million tons with gully erosion sources contributing the remaining 3.7 million tons. Basinwide, gross erosion averages 7.7 tons per acre annually.

Sediment yields were estimated by sub-basins. The sum of the sub-basin yields is 14.3 million tons. Sediment yield averages range from 1.13 tons per acre annually in sub-basin 34h to 2.50 tons per acres in sub-basin 34 Upper. Annual sediment yield at the outlet of the basin is about 4.0 million tons.

Agricultural Pollutants

Agricultural pursuits often cause problems that affect the quality of land and water resources. Farming methods, soil type, kind and extent of crops and conservation practices installed contribute to the potential

hazard. Generally the problems relate to insecticides, plant nutrients, animal waste and sediment (discussed separately).

Accurate evaluations of the problems concerning insecticide use in the basin are difficult, as application rates are not available. However, using cotton acreages to evaluate the problem at an estimated rate of 15.41 pounds per acre, there was approximately 1,142 tons of insecticides applied in 1970. This was primarily methyl parathion and toxaphene.

Occasional small fish kills in tributary streams have been attributed to agricultural chemicals. However, the distribution of the cotton acreage in the basin and the relatively small amount of crops demanding high insecticide applications have reduced the potential insecticide problem. Present data does not indicate buildups of insecticides in fish above the allowable tolerance levels set by the Food and Drug Administration.

The effects of plant nutrients on water quality is often a major problem. An over-abundance of nitrogen in potable water can cause concern by health officials. Phosphorous applied to cropland quickly attaches itself to the clay fractions and erosion that washes these soil particles into streams and lakes can bring in so much phosphorous that aquatic vegetation grows profusely and interferes with recreational uses of the water.

Presently, sufficient data concerning possible pollution of basin waters from excessive amounts of plant nutrients are not available. Proper control of erosion and sediment damage to basin waters appears to be sufficient to keep the potential problem in check at the present time.

The pollution potential from farm animals is considered to be proportionate to the degree of confinement and the waste management system applied. In this study, animals with free access to open spaces are not considered as posing a pollution potential.

Currently, beef cattle operations pose no pollution problem. Pollution problems do prevail on farms with dairy, swine, and layer operations--most of which require waste treatment and disposal improvements.

Fish and Wildlife Habitat

Historically, the habitat for wildlife has gone full circle from abundant habitat full of wild game in the "early years"--to the desolation of the habitat and game populations of the early 1900's--to the abundant game populations and improved habitat of today. In general, there is a good balance today of all types of wildlife habitat. However, there are changes occurring in land use that produce habitat damage in localized areas.

Presently, pollution, flooding, and sediment do not seriously affect fish and wildlife habitat. This is not to say that there are not localized problems but, in general, such occurrences are relatively minor in scope. Problems exist in areas such as the Tibbee River in Clay County, Luxapalila Creek below Columbus in Lowndes County, and Noxubee River below Macon in Noxubee County.

Objectives

The Principles and Standards specify that the overall purpose of water and land resource planning will be directed toward improvement in the quality of life through contributions to the objectives of National Economic Development (NED) and Environmental Quality (EQ). These objectives provide for the use of water and land resources to meet foreseeable short and long-term needs of a basin as stated or implied by Congressional Acts and Executive actions.

The NED objective is to enhance national economic development by increasing the value of the Nation's output of goods and services and improving national economic efficiency. The EQ objective is to enhance environmental quality by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems. This objective reflects society's concern and emphasis for the natural environment and its maintenance and enhancement as a source of present enjoyment and a heritage for future generations.

The problems of the basin were identified and the following list of study concerns were developed.

a. To increase basin production and agricultural income.
b. To improve forest management.
c. To reduce erosion and sediment.
d. To reduce flood damages in upstream watersheds.
e. To improve existing recreational areas.
f. To develop additional recreational areas.
g. To enhance fish and wildlife habitat.
h. To identify and preserve natural aesthetic and scenic features.
i. To identify and preserve archaeological and historical values.
j. To enhance the quantity and quality of surface and ground water resources.

The study concerns were translated into specific components of the NED and EQ objectives and are displayed in table 3.1.

Table 3.1. Problems and objectives summary, Tombigbee River Basin

Primary objectives	Problems (public concerns)	Specific components of the objectives	
		First level	Second level
National Economic Development	1. Frequent flooding in upstream watersheds on 1.4 million acres of land.	Increased or more efficient output of food and fiber.	1. Reduce frequency of flooding in the upstream watersheds and increase the acres of flood free land.
	2. Wetness hazards on 502,100 cropland acres and 424,372 pastureland acres result in reduced yields.		2. Provide for adequate drainage on cropland and pastureland.
	3. Present management and land use results in excessive erosion on cropland, pastureland, and forestland and increases production costs and damage to the land resource base. (3.1 million acres)		3. Provide for improved technology and proper conservation practices for cropland, pastureland, and forestland.
	4. Critical erosion from gullies and streambanks, as well as from steep cropland, pastureland, and some forestland damages the land resource base. (348.1 thousand acres)		4. Provide for proper treatment to critical areas.
	1. Inadequate recreation facilities to meet activity occasion needs.	Increased or more efficient output of recreational services.	1. Provide recreation facilities and recreation opportunities.
	2. Sediment yields reduce the quality of water for recreation purposes. (14.3 million tons annually)		2. Provide for erosion and sediment control.
	3. Use of insecticides and plant nutrients and the animal waste pollution potential affects water quality		3. Provide for proper use of insecticides and fertilizers and the proper treatment of animal wastes.

(continued)

Table 3.1. Problems and objectives summary, Tombigbee River Basin (continued)

Primary objectives	Problems (public concerns)	Specific components of the objectives	
		First level	Second level
Environmental Quality	1. Improper management of natural areas reduces overall environmental quality.	Preserve the natural aesthetic and scenic features of the basin.	1. Provide for identification and proper management of these scenic features.
	1. Critical erosion from gullies and roadbanks throughout the basin affect water quality and the land base.	Improved quality of water and land resources.	1. Provide for erosion control and sediment control.
	2. Use of insecticides and plant nutrients and animal wastes pollution potential affects water quality of streams and lakes.		2. Provide for proper use of insecticides and fertilizers and the proper treatment of animal wastes.
	1. Adequate land and water resources for proper management of fish and wildlife resources.	Improve quality of biological resources and ecosystems.	1. Provide for proper management of these resources.
	1. Loss of or improper use of the historical values of the basin.	Preserve the archaeological and historical values of the basin.	1. Provide for identification and proper management of these values.

CHAPTER IV

ECONOMIC DEVELOPMENT, PROJECTIONS, AND ENVIRONMENTAL PREFERENCES

Historical Development

The overall environment of this basin has been greatly affected by economic development. After the acquisition of the land from the Indians, vast acreages of timberland were cleared for cropland and pastureland. Much of this land was unsuited for sustained agriculture and quickly deteriorated into gullies and non-productive abandoned fields. During this period the basin residents were distributed throughout the countryside, and the overall effect of their presence was borne by the natural resources of the basin. Few areas were spared the exploitive actions of man. Forests were cleared, fields were farmed and abandoned to erode and wash; wildlife was virtually eliminated; and streams and lakes were damaged by sediment from eroding fields.

Eventually much of the land once farmed was allowed to re-vegetate into native tree species and forest healed many of the scars of man's first agricultural efforts. Many rural residents moved to town or left the basin. Mississippi and Alabama began to protect and restock deer, turkey and other wild game species. Landowners began to plant and improve forests. Some farmers incorporated sound conservation practices in their farming programs. Sediment discharges were considerably reduced as erosion was controlled and forest established. The environmental '60's further awakened a sense of environmental awareness as basin residents began to take more interest in their surroundings and become more appreciative of their environment.

Socio-Economic Indicators

The need for conservation, development, utilization, and management of water and land resources is related to the present and projected economic activity in the basin. Past, present, and expected future indications of economic activity were developed to establish an economic setting and general framework for planning.

Assumptions

The projections presented in this report, to the extent possible, are geared to the Series C OBERS[1/] projections that are shaped by long-run or secular trends in the economy rather than by cyclical fluctuations

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1/ Economic projections prepared by the Bureau of Economic Analysis, U. S. Department of Commerce, and the Economic Research Service, U. S. Department of Agriculture--popularly termed OBERS.

which characterize the short-run path of development. Assumptions, either explicit or implicit, that reflect this general principle are as follows:

(1) Growth in population will be conditioned by a substantial decline from the fertility rates of the 1962-1965 period;

(2) Reasonably full employment will prevail at each of the projection points;

(3) At projected dates, the economy is considered free of the destructive effects of foreign conflicts;

(4) Stability will be maintained in the conduct of international trade;

(5) Continued technological progress and capital accumulation will support a growth in output per man-hour of 3 percent annually;

(6) Development of new products will be accommodated within the existing industrial classification system;

(7) Growth in output within the context of the existing industrial structure can be achieved with environmental balance, although this may require control of energy resources, restriction of the use of pesticides and other chemical products; and,

(8) The historical trends in import/export activity are extended into the future except for agricultural exports, though continuing to increase, will constitute a smaller percentage of U. S. production.

Basin projections are based on the assumption that factors influencing historical trends will continue into the future. Basin trends were modified where limitations in the resource base were known or anticipated or where other critical developments appeared highly probable. Projections in this report should not be considered a goal, an assigned share, or a constraint on the basin's economic activity. Alternative levels of economic activity may be achieved, depending in part on the amount of resource development, or the lack of it, in the basin and surrounding areas.

Population

Population in the United States is projected to increase from the 1970 base by some 34 percent in 1990 and 73 percent by 2020. The projected rates of growth for Alabama and Mississippi are 21 and 70 percent (Alabama) and 16 and 54 percent (Mississippi).1/ These data indicate

1/ OBERS projections, Series C.

the two States will grow at a slower rate than the rest of the country during the next 20 years; growth from 1990 through 2020 is projected to be in line with national rates.

While the population in the Tombigbee Basin has been declining historically, a reversal of this trend is projected for 1990 (table 4.1).

Population projections for the basin are based on 1972 Series C OBERS and county estimates developed by the Alabama Development Office. Projections for small areas are difficult to make with precision due to the difficulties of estimating migration rates in these areas. Population projections are important, since resource needs depend on the size, growth, and characteristics of the population. Significant increases in total population will depend primarily upon growth of the nonfarm sector of the basin economy.

Table 4.1. Population, by state portions, Tombigbee River Basin, 1930 to 1970, and projected 1980, 1990, 2000, and 2020

Year	Basin population in --		Basin total
	Alabama	Mississippi	
	Number	Number	Number
1930	219,001	271,953	490,954
1940	231,041	293,012	524,053
1950	212,997	283,906	496,903
1960	194,498	276,994	471,492
1970	184,202	272,361	456,563
1980	199,000	318,000	517,000
1990	214,000	343,000	557,000
2000	232,000	371,000	603,000
2020	276,000	441,000	717,000

Source: Historical data from Census of Population, United States Department of Commerce; projection based on data from the Alabama Development Office and 1972 Series C OBERS.

Employment

The 1970 Census of Population was the source of employment data used in this report. The 1970 employment-population ratio for the basin was 35.7 percent. This is consistent with OBERS Economic Areas in surrounding States and represents a 20 percent increase from the 1960 ratio.

As table 4.2 indicates, manufacturing, wholesale and retail trade, and services provide almost 70 percent of the employment in the basin. Employment in agriculture has declined since 1940 but it appears this trend has about reached an end. In the future, increases in nonfarm employment will not be tempered with declines in farm employment. Thus, total employment is projected to increase moderately over the next several decades (table 4.3).

Table 4.2. Historical employment, by industry, Tombigbee River Basin, 1940-1966

Industry	1940	1950	1960	1966
	Percent			
Agriculture	51.5	35.9	15.2	11.7
Mining	.2	.6	1.2	.8
Contract construction	3.1	4.7	7.8	7.0
Manufacturing	14.3	19.5	23.9	27.9
Transportation, communication, and public utilities	3.7	5.3	5.9	5.5
Wholesale and retail trade	8.6	14.0	17.6	17.2
Finance, insurance, and real estate	.8	1.3	2.1	2.3
Services	16.1	16.4	23.1	22.6
Government	1.7	2.3	3.2	5.0
Total	100.0	100.0	100.0	100.0

Source: Bureau of Economic Analysis, United States Department of Commerce.

Table 4.3. Projected employment by industry, Tombigbee River Basin, 1980, 2000, and 2020

Industry	1980	2000	2020
	Number	Number	Number
Alabama:			
Agriculture	4,375	3,160	3,170
Mining	530	850	610
Contract construction	5,655	6,490	7,660
Manufacturing	19,910	23,120	27,880
Transportation, communication, and public utilities	4,010	4,490	5,205
Wholesale and retail trade	12,540	14,720	18,070
Finance, insurance, and real estate	1,930	2,490	3,375
Services	18,530	23,210	29,920
Government	4,160	4,990	6,230
Total	71,640	83,520	102,120
Mississippi:			
Agriculture	6,980	5,075	4,920
Mining	805	795	950
Contract construction	9,040	10,420	11,905
Manufacturing	31,840	37,135	43,350
Transportation, communication, and public utilities	6,410	7,210	8,095
Wholesale and retail trade	20,030	23,635	28,100
Finance, insurance, and real estate	3,090	4,000	5,240
Services	29,650	37,260	46,520
Government	6,635	8,020	9,680
Total	114,480	133,550	158,760
Basin total:			
Agriculture	11,355	8,235	8,090
Mining	1,335	1,645	1,560
Contract construction	14,695	16,910	19,565
Manufacturing	51,750	60,255	71,230
Transportation, communication, and public utilities	10,420	11,700	13,300
Wholesale and retail trade	32,570	38,355	46,170
Finance, insurance, and real estate	5,020	6,490	8,615
Services	48,180	60,470	76,440
Government	10,795	13,010	15,910
Total	186,120	217,070	260,880

Source: Bureau of Economic Analysis, United States Department of Commerce

Employment projections are tied closely to population projections, and these projections are critical in planning for the resource needs of the future, particularly municipal and industrial water supplies. The level of employment is a major determinant of the demand for goods and services, as well as recreational and other amenities affecting the resource base and needs to be considered in plan formulation.

Unemployment in the basin has been higher historically than the State rate in either Alabama or Mississippi, but this disparity has been decreasing, particularly during the 1960-70 decade. These rates can be misleading for at least two reasons: First, they reflect conditions at a point in time, and data on unemployment in rural areas is usually quite sketchy; second, this is an area where underemployment has traditionally been a problem. This unemployment data may not reflect accurately the prevailing economic climate. Thus, it would seem that employment data are much more appropriate for planning purposes.

Income

To the extent that consumption is a function of income, per capita income estimates provide a basis for determining demands and hence resource needs. Marginal changes in income are useful to determine future demands for goods and services that have high income elasticities, such as recreation. That is, the increase in quantity demanded per dollar increase in income is relatively high.

Table 4.4 provides historical income data for the basin. Personal income in 1970 was nearly quadruple the 1950 rate; despite this increase, personal income in the basin was still low compared with the U. S. average. The basin average of $2,469 was only 67 percent of the U. S. average of $3,700.

Per capita income, in 1967 dollars, is projected to increase from $2,291 to $4,600 in 1990 and to $11,700 by 2020 (table 4.5). If population and income expand as projected, total personal income in the basin by 2020 would approach $9.5 billion. These optimistic projections rest on the assumptions of 4 percent unemployment and a 2.9 percent annual increase in productivity in the private sector. The recent increase in energy prices and deviations from the productivity and employment assumptions cause these projections to be suspect in the minds of some analysts. Reduced income projections translate into lower levels of demands for goods and services, and hence less strain on the basin's resources.

Agriculture

An appraisal of agricultural economic activity is basic to wise and constructive planning of the competitive use of resources. The basin is dependent upon agriculture as a means of providing a livelihood for some

Table 4.4. Per capita personal income, by state and county, Tombigbee River Basin, 1950, 1960, and 1970
(Current dollars)

State and county	1950	1960	1970
	Dollars	Dollars	Dollars
Alabama:			
Choctaw	464	820	2,106
Clarke	758	1,059	2,051
Fayette	572	937	2,278
Franklin	628	950	2,217
Greene	398	655	1,552
Hale	437	857	1,825
Lamar	438	1,055	1,977
Marengo	521	910	2,055
Marion	531	1,099	2,578
Mobile	1,090	1,683	2,924
Pickens	457	878	2,082
Sumter	500	698	1,763
Tuscaloosa	850	1,519	2,671
Walker	NA	NA	2,246
Washington	546	847	2,749
Winston	556	1,268	3,052
Sector average	718	1,272	2,418
Mississippi:			
Chickasaw	510	1,028	2,590
Choctaw	412	628	1,664
Clarke	576	839	2,114
Clay	649	1,103	2,972
Itawamba	579	912	2,102
Kemper	376	580	1,508
Lauderdale	1,059	1,473	3,128
Lee	780	1,279	3,301
Lowndes	768	1,487	2,818
Monroe	609	1,120	2,668
Noxubee	458	649	1,896
Oktibbeha	614	972	2,084
Pontotoc	600	847	2,071
Prentiss	652	889	2,029
Tippah	574	1,033	2,054
Tishomingo	569	957	2,195
Union	694	963	2,435
Webster	566	782	2,087
Winston	579	866	2,309
Sector average	677	1,099	2,553
Basin average	702	1,208	2,469

Source: Bureau of Economic Analysis, United States Department of Commerc

Table 4.5. Per capita and total personal income, Tombigbee River Basin, 1970, and projected 1980, 1990, 2000, and 2020 1/

Year	Per capita income	Total personal income
	Dollars	Million dollars
1970	2,291	1,042
1980	3,400	1,788
1990	4,600	2,728
2000	6,400	4,179
2020	11,700	9,454

Source: Office of Business Economics, United States Department of Commerce.

1/ 1967 dollars.

of its inhabitants, whether it be from actual production of goods or agri-businesses supplying goods and services to farm operators.

Land in Farms

Basin land in farms was approximately 3.9 million acres in 1969. There is a definite downward trend in land in farms. Between 1954 and 1969, the farm land base declined approximately 2.2 million acres or about 143.8 thousand acres a year. The farm land base is anticipated to continue to decline; however, further reductions are not expected to be drastic.

Farms

There were 19.3 thousand farms in the basin in 1969 as compared with 51.5 thousand in 1954. The number of farms is declining and this trend is expected to continue. Farmers and farm families have been leaving the farm in large numbers. Consolidation of small farm units into larger operating units has been an important factor contributing to the net decrease in farm numbers. In many instances, marginal farm operators discontinue farming as a major source of family income and seek off-farm employment. However, they tend to maintain the farm home as a place of residence and rent their land to full-time farm operators.

Size of Farms

Small farms are still characteristic of the basin, although the average size of farms increased from 117 acres in 1954 to 201 acres in

1969, an increase of 72 percent. In the future, more of the basin's small farms will probably be consolidated with larger farms. This trend will be influenced by increased farm technology and mechanization of agriculture. Also, many small farms will probably cease operations. Th availability of nonfarm job opportunities will contribute significantly to this trend.

Crops

Historically cotton has been the most important crop grown in the basin. It is important in terms of acreage, cash income, use of family labor, and purchased input consumption. However, its importance has declined considerably in recent years. Acreage declined from about 225.6 thousand acres in 1960 to about 148.2 thousand acres in 1970. Productior in 1970 was 124.2 thousand bales and the average yield per acre was 408 pounds.

Corn has been an important crop enterprise in the farm business but its importance is declining. Acreage declined from about 312.3 thousand acres in 1960 to about 94.8 thousand acres in 1970. Production in 1970 was 1.9 million bushels and the average yield per acre was 23 bushels.

Soybeans have become an important crop in recent years. Acreage increased from about 44.8 thousand acres in 1960 to about 359.0 thousand acres in 1970. Thus, many basin farmers are using for soybeans some acreage previously used for cotton and corn. Soybean production in 1970 was 8.7 million bushels and the basin average yield per acre was 24 bushels.

Other minor row and close seeded crops include wheat, oats, and peanuts. The land used, inputs applied, and products derived therefrom are relatively minor compared to cotton, soybeans, and corn.

Hay crops are important in the farm business. Basin acreage was about 188.6 thousand acres in 1960, 193.1 thousand acres in 1965, and 152.7 thousand acres in 1970. Acreage fluctuates from year to year but fluctuations stay within a relatively small range.

Livestock

Most farms in the basin produce some type of livestock. In some cases, production may be primarily for home use; but in most cases, the livestock are for sale. Livestock sales, particularly cattle and calves, account for most of the returns from hay and pasture acreage.

In 1969, basin farmers marketed about 237.2 thousand head of cattle and calves, 158.9 thousand head of hogs and pigs, and 20.9 million head of broilers. Marketing of sheep and lambs, turkeys, and chickens are limited.

Value of Agricultural Production

Basin farmers marketed $105.3 million worth of agricultural products in 1969. Livestock sales accounted for $72.3 million or 69 percent of the total. Crop sales accounted for $33.0 million or 31 percent of the total.

Additional Farm Income

Sources of revenue for farmers, in addition to crop and livestock enterprises, include custom work and other agricultural services, recreational services, and government farm programs. In 1969, revenues derived therefrom were $1.3 million, $98.5 thousand, and $13.9 million, respectively. Custom work and other agricultural services income are expected to continue to increase as greater specialization develops. Farmers' earnings from recreational enterprises are perhaps just beginning. As Americans spend more and more of their income for recreation, farm-based recreational activities will undoubtedly increase.

Forestry

Acreage and Ownership

The basin contains 5.8 million acres of forest land. The Alabama portion contains 3.8 million acres and the Mississippi portion 2.0 million acres (table 4.6).

Ownership is categorized into four types--miscellaneous private, farm, forest industry, and National Forests and other public. Miscellaneous private accounts for 2.6 million acres or 46 percent of the total. Most of this acreage is located in the Alabama portion of the basin. Farm forest accounts for 1.8 million acres or 31 percent of the total. This acreage is fairly evenly divided between the Alabama and Mississippi portions of the basin. Forest industry accounts for 1.1 million acres or 20 percent of the total. Seventy-six percent of this acreage is located in the Alabama portion of the basin. National Forests and other public accounts for 190.6 thousand acres or three percent of the total. All of the National Forest acreage is located in the Mississippi portion of the basin.

Forest Types

The forest resource is categorized into five types as shown in table 4.7. Loblolly-shortleaf pine accounts for 1.7 million acres or 29.8 percent of the total. Oak-hickory accounts for 1.5 million acres or 25.2 percent of the total. Oak-pine accounts for 1.3 million acres

Table 4.6. Forestland ownership, Tombigbee River Basin, 1970

Ownership	Part in --		Total	Distribution
	Alabama	Mississippi		
	1,000 acres	1,000 acres	1,000 acres	Percent
Misc. private	1,870.7	771.3	2,642.0	46
Farm forests	972.8	831.3	1,804.1	31
Forest industry	878.0	270.6	1,148.6	20
National forest and other public	39.2	151.4	190.6	3
Total	3,760.7	2,024.6	5,785.3	100

Source: Forest Service, United States Department of Agriculture.

Table 4.7. Forest types and associated acreage, Tombigbee River Basin, 1970

Type	Part in --		Total	Distribution
	Alabama	Mississippi		
	1,000 acres	1,000 acres	1,000 acres	Percent
Loblolly-shortleaf pine	1,234.5	490.7	1,725.2	29.8
Oak-hickory	835.1	622.5	1,457.6	25.2
Oak-pine	877.5	448.3	1,325.8	23.0
Bottomland Hardwoods	691.6	454.6	1,146.2	19.8
Longleaf-slash pine	122.0	8.5	130.5	2.2
Total	3,760.7	2,024.6	5,785.3	100.0

Source: Forest Service, United States Department of Agriculture.

or 23.0 percent of the total. Bottomland hardwoods accounts for 1.1 million acres or 19.8 percent of the total. Longleaf-slash pine accounts for 130.5 thousand acres or 2.2 percent of the total. The Alabama portion of the basin naturally accounts for a majority of the acreage of each type since the total base acreage is 86 percent greater than in Mississippi. The distribution of forest types is depicted on map 4.1.

Volumes

Growing stock volume was estimated at 4.7 billion cubic feet in 1972. Softwood species accounted for 55 percent of the total and hardwood species 45 percent. Based on the total acreage of forests, there is a simple average of 815.4 cubic feet per acre. The State of Alabama averages 947.0 cubic feet per acre and the State of Mississippi averages 772.0 cubic feet per acre.

Growth

Basin-wide there is an upward trend in growth per acre. During the period 1960 to 1973, average annual net growth increased from 37.8 cubic feet per acre to 57.4 cubic feet per acre. As noted in figure 4.1, most of the forests in Alabama counties have a growth rate of 60 plus cubic feet per acre. Most forests in the Mississippi portion of the basin have a growth rate ranging from 20 to 60 cubic feet per acre. Total annual growth for the basin was 332 million cubic feet in 1973.

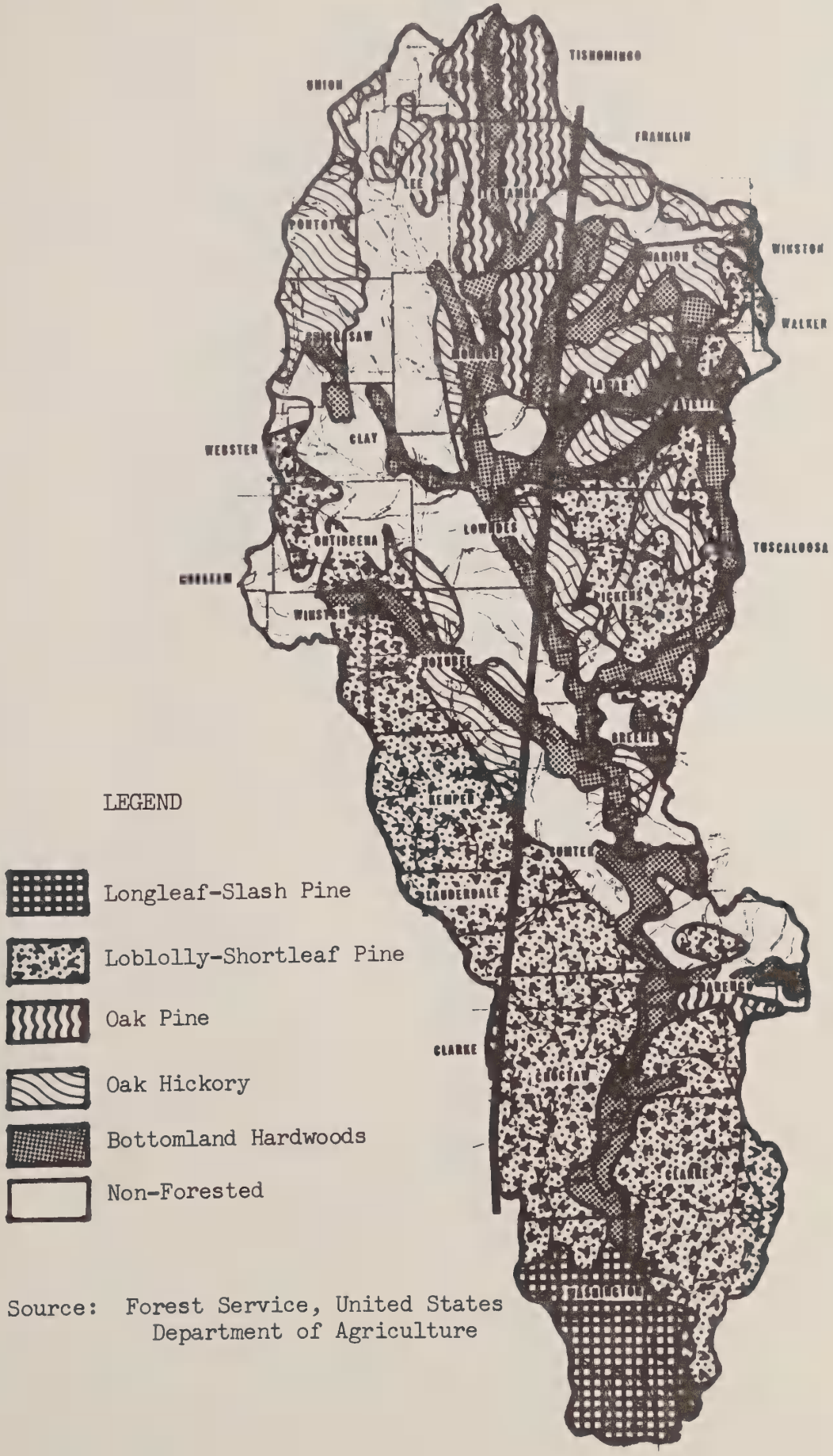
Cut

There is an upward trend in timber removal per acre in the basin. Timber removals increased from 25.4 cubic feet per acre in 1960 to 35.9 cubic feet in 1971.

In 1971, the timber harvested within the basin amounted to 206.4 million cubic feet (table 4.8). Softwoods accounted for 64 percent and hardwoods 36 percent.

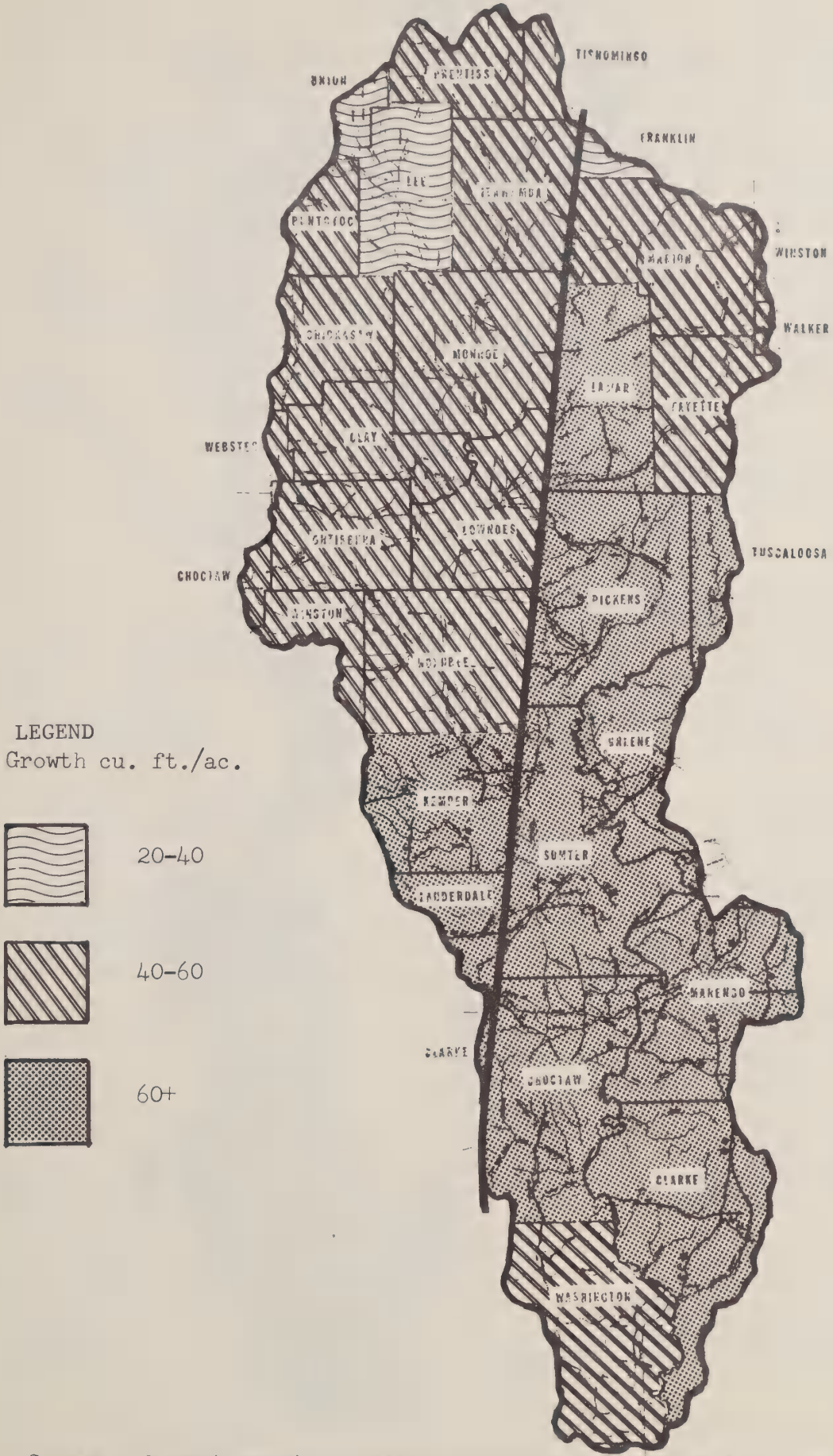
Heaviest removals are in the central and southern portions of the basin. The productive soils and gentle topography of these areas are favorable to forest harvesting practices. These heavy removals are largely in pine and mixed oak-pine forest types. See figure 4.2 for percent of growth removed.

Map 4.1. General forest types, Tombigbee River Basin, 1970



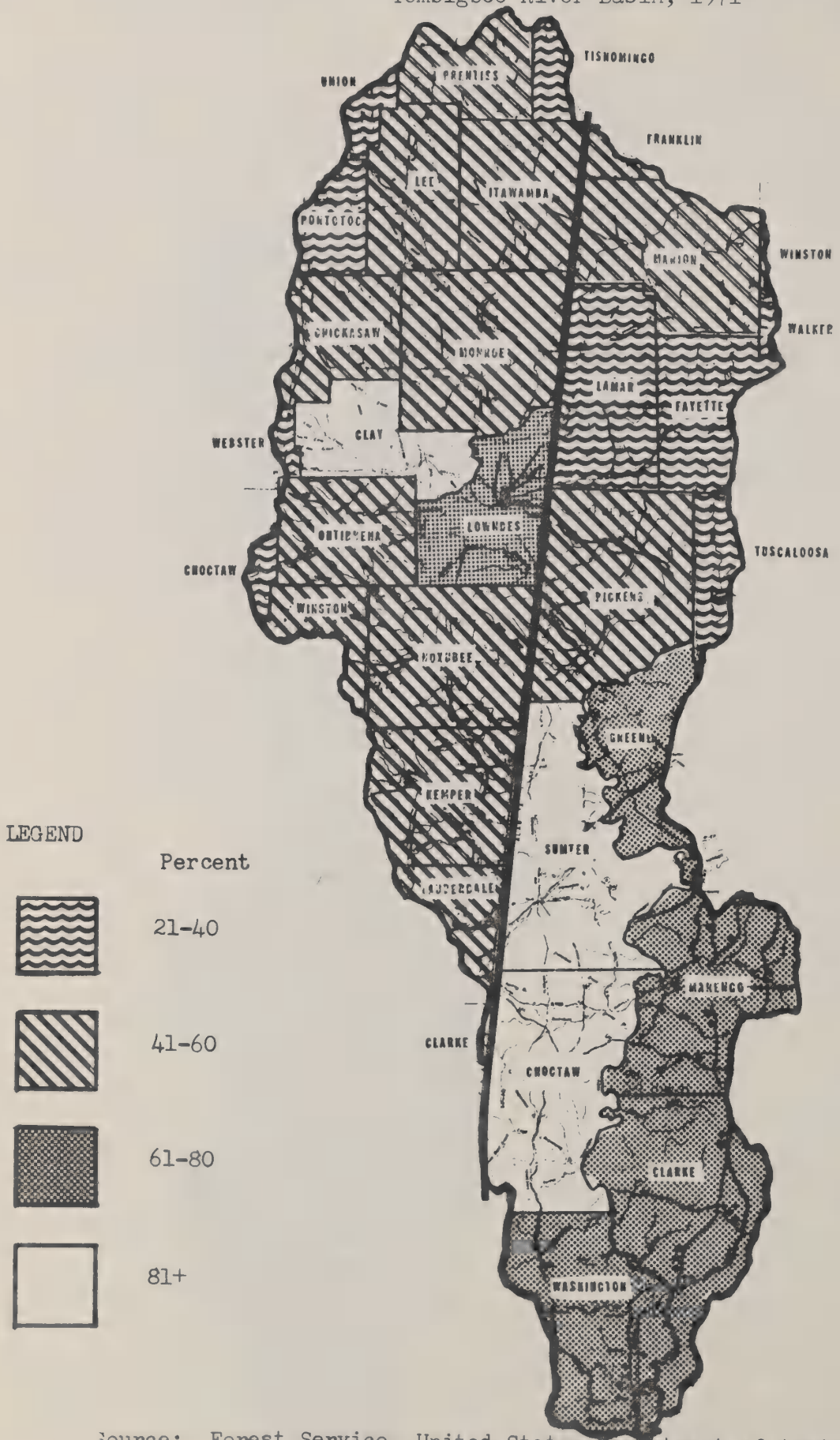
Source: Forest Service, United States Department of Agriculture

Figure 4.1. Net annual growth per acre, Tombigbee River Basin, 1973



Source: Forest Service, United States Department of Agriculture

Figure 4.2. Percent of timber growth removed, by county, Tombigbee River Basin, 1971



Source: Forest Service, United States Department of Agriculture

Table 4.8. Average annual roundwood removals, Tombigbee River Basin, 1971

State	Softwood	Hardwood	Total	Average cut per acre
	Mil. cu.ft.	Mil. cu.ft.	Mil. cu.ft.	Cu.ft.
Alabama	104.1	49.0	153.1	36.7
Mississippi	27.7	25.6	53.3	27.4
Total	131.8	74.6	206.4	35.9

Source: Forest Service, United States Department of Agriculture.

Forest Range

Most cattle grazing on forestland is concentrated within the Blackbelt area of the basin. In 1970, about 885.0 thousand acres of forestland was used for the grazing of cattle. Most of this use occurred on forests adjacent to pasture. This use of forestland is anticipated to continue in future years.

Pine types with 100 percent grass cover produce 2,500 pounds of oven-dried forage per acre per year. This condition rarely exists in forest stands except for brief periods when the stand is opened to full sunlight by harvest cuts or regeneration practices. The present average grass production on pine types is 500 pounds per acre or about 20 percent of the potential. The average grass production for all forestlands within the basin is 475 pounds per acre.

Both oak-hickory and bottomland hardwood types are poor for grazing because of low grass yields. Grazing of these forest types is undesirable because of conflicts with wildlife, recreation, and timber production.

The estimated potential of the present forest grazing resource is presented in table 4.9. The resource base has the potential of producing 13.6 million pounds of beef annually.

If the oak-hickory and bottomland hardwood forests are excluded from grazing, grass production on pine and pine-hardwood forests is currently 1.6 billion pounds per year. This amount of forage will support 529.7 thousand animal units per year or 7.9 million pounds of beef.

Table 4.9. Forest range resource, Tombigbee River Basin, 1970

Forest Type	Area	Grass Cover	Forage produced annually	Potential AUM's annually	Potential lbs. beef produced annually
	1,000 ac.	Percent	Mil. lbs.	1,000	Million
Longleaf-slash pine	130.5	70	228.4	76.2	1.1
Loblolly-shortleaf pine	1,725.2	20	862.6	287.6	4.3
Oak-pine	1,325.8	15	497.2	165.9	2.5
Oak-hickory	1,457.6	20	728.2	242.6	3.6
Bottomland hardwood	1,146.2	15	429.8	143.2	2.1
Total	5,785.3	N/A	2,746.2	915.5	13.6

Source: Forest Service, United States Department of Agriculture.

Forest Industry

The production, harvesting, and marketing of forest products are vital parts of the economy of the basin. In 1972, the stumpage value of sawtimber and poletimber was approximately $22.4 million. Eighty-one percent of the total value was generated by sales of softwood products and 19 percent by sales of hardwood products.

As indicated by data in table 4.10, most of the income generated is from the sale of sawtimber--approximately 71 percent. Poletimber sales account for approximately 29 percent. Timber product sales are much greater in the Alabama portion of the basin than in the Mississippi portion.

In 1970, here were approximately 459 forest industries located in the counties comprising the basin (see figure 4.3). Pulp mills are located in the southern and central portions of the basin. They are generally located near areas with a high density of loblolly-shortleaf species. Small and large sawmills are distributed throughout the upper portion of the basin. These mills are generally associated with areas containing oak-pine and oak-hickory forest types.

The timber-based industries are of major economic importance. They provide nearly 18.0 thousand jobs and contribute about $99.1 million in wages annually (table 4.11).

Table 4.10. Estimated stumpage value of forest products, by states, Tombigbee River Basin, 1972

Item	Sawtimber	Poletimber	Total
	Dollars	Dollars	Dollars
Softwood			
Alabama	11,867,000	3,586,000	15,453,000
Mississippi	1,496,000	1,262,000	2,758,000
Sub-total	13,363,000	4,848,000	18,211,000
Hardwood			
Alabama	159,000	1,334,000	1,493,000
Mississippi	2,304,000	356,000	2,660,000
Sub-total	2,463,000	1,690,000	4,153,000
Grand Total	15,826,000	6,538,000	22,364,000

Source: Forest Service, United States Department of Agriculture.

Fire, Insects, and Disease

An average of 9.5 thousand acres burn annually in the basin. Figure 4.4 displays a five-year average fire occurrence by counties. Most fires are kept small, less than 20 acres in size, and the annual growth loss due to fire is only 800 cubic feet.

The goal in both Alabama and Mississippi is to reduce the annual burn to 0.25 percent of the total forest area. Over the past five years, the average annual forestland burn is 0.17 percent. This excellent record is primarily due to the efficiency of the Alabama and Mississippi Forestry Commissions' fire detection and suppression organizations. As evidenced by figure 4.4, eight of the 31 counties, lying partly or totally within the basin, have a high rate of burn ranging from 0.21 to over 0.61 percent. Some acceleration of effort is needed in this area which lies primarily in the northeast portion of the basin. Another key factor affecting fire control is the cyclic effect of the rainfall pattern in the basin. Periods of below normal rainfall, which may extend for one or two years, creates an explosive burning condition on forest lands. Since these are

Figure 4.3. Location of forest industries, Tombigbee River Basin, 1970

Source: Forest Service, United States Department of Agriculture

Table 4.11. Summary of timber-based industries, Tombigbee River Basin, 1970

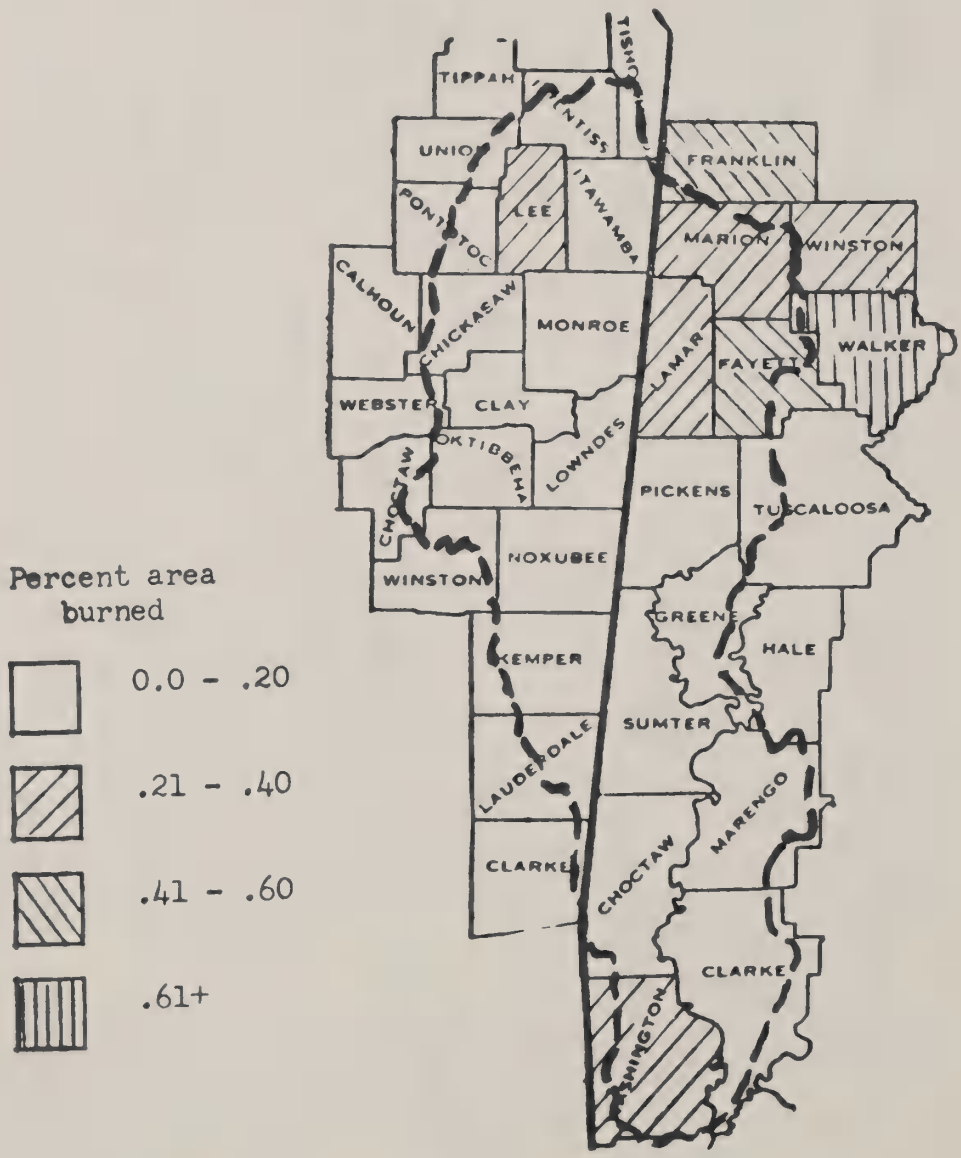
Type industry 1/	Firms			Ave. monthly employment			Annual wages		
	Miss.	Ala.	Total	Miss.	Ala.	Total	Miss.	Ala.	Total
	No.	No.	No.	No.	No.	No.	Thou. dol.	Thou. dol.	Thou. dol.
Management and harvesting 2/	6	4	10	31	53	84	87	182	269
Primary manufacturing (sawmills, veneer mills, pulp mills, etc.)	122	259	381	3,874	9,746	13,620	17,586	60,051	77,637
Secondary manufacturing	18	50	68	2,393	1,844	4,237	12,844	8,390	21,234
Total	146	313	459	6,298	11,643	17,941	30,517	68,623	99,140

Source: Forest Service, United States Department of Agriculture.

1/ This list is not comprehensive or complete. Considerable employment in construction, transportation, and marketing is attributable to the wood materials involved.

2/ Much of the part-time employment in forestry services is not reported and not shown here. Some part-time employment and on-farm labor in timber harvesting is also missing from this data. Forest management activity by the states of Alabama and Mississippi, and the United States Government is not recorded here.

Figure 4.4. Average percent of area burned by wildfire, Tombigbee River Basin, 1969-1973



Source: Forest Service, United States Department of Agriculture.

the periods in which the most extensive damage occurs, state, federal, and private fire suppression organizations must be flexible enough to gear up to meet these emergency situations. A continuation of the on-going fire control program along with provisions to meet emergency situations appears to be sufficient to meet future needs.

Insects and disease reduce growth or cause mortality. Roundwood losses due to insects amount to 1.3 million cubic feet annually. Losses from diseases account for an additional 0.9 million cubic feet for a combined loss of 2.2 million cubic feet. When losses from fire are added, the annual total is 3 million cubic feet. Compared to the annual production of 332 million cubic feet, these losses are insignificant.

Recreation

Outdoor recreation plays a significant role in the leisure time activities of the basin residents. Being rural in nature and having few large towns, colleges or other entities offering culturally oriented activities, outdoor recreation is very important.

Table 4.12 lists public use outdoor recreation facilities in the basin. Swimming, picnicking, fishing, camping, hiking, hunting, and boating are common recreation pursuits in these areas. Thousands of visits are made to these areas generating many thousands of dollars in revenues to basin businesses.

Archaeological and historical sites are also listed in table 4.12. Thousands of visits are made to these sites annually by residents and non-residents. Non-resident use is heavy in state parks, lakes, and historical sites.

Present supply and demand estimates for selected outdoor recreation activities are presented in table 4.13. Based on $2.25 per day,[1/] an estimated total expenditure of $20.5 million is generated annually. If the total demand for all outdoor recreation activities for residents and non-residents were considered, the estimate probably would exceed $40.0 million annually.

Fish and Wildlife

Hunting and fishing resources are more than adequate to meet the demand by basin residents. There is a surplus of most game populations at present and a considerable underutilized fishery resource.

Fish and game harvests are important socio-economic contributors to the overall economy of the basin. Hunting and fishing are traditional in the life style of the residents and command a sizable portion of their time and money. Purchases of hunting and fishing licenses, boats, motors,

1/ USDA Procedures For Planning Water And Related Land Resources, United States Department of Agriculture, March 1974.

Table 4.12. Inventory of selected recreational, archaeological, and historical sites, Tombigbee River Basin, 1975

Type of area	Location	Description
State Parks		
Tombigbee State Park	Lee Co., Miss.	940 acres; 120 acres water, picnic area, beach, water, skiing, fishing, swimming, hiking trails, horseback trails, nature study.
Bladon Springs State Park	Choctaw Co., Ala.	357 acres; picnicking, camping, hiking and nature trails, play areas.
Chickasaw State Park	Marengo Co., Ala.	560 acres; picnicking, camping.
National Forests		
Tombigbee National Forest	Chickasaw, Choctaw and Winston Cos., Miss.	65,232 acres; 391 acres water, picnic area, beach, fishing, big and small game hunting, camping, horseback trail, nature study.
Wildlife Refuges		
Noxubee National Wildlife Refuge	Noxubee, Winston, and Oktibbeha Cos., Miss.	46,000 acres; 1400 acres water, 400 acres wetland, picnicking, camping, big and small game hunting, waterfowl hunting, nature trail, bird watching.
Choctaw National Wildlife Refuge	Choctaw Co., Ala.	4,218 acres; on Tombigbee River - waterfowl.
State Game Management Areas		
Choctaw Wildlife Management Area	Choctaw and Winston Cos., Miss.	50,000 acres; 90 acres water, big and small game hunting - under supervision of Miss. Game and Fish Commission.
Chickasaw Wildlife Management Area	Chickasaw and Pontotoc Cos., Miss.	28,000 acres; big and small game hunting.
John Bell Williams Wildlife Management Area	Itawamba and Prentiss Cos., Miss.	11,000 acres; big and small game hunting.
Kinterbish Wildlife Management Area	Choctaw and Sumter Cos., Ala.	13,614 acres, big and small game hunting.
Scotch Wildlife Management Area	Clarke Co., Ala.	20,480 acres; big and small game hunting.
Lamarion Wildlife Management Area	Lamar and Marion Cos., Ala.	25,520 acres; big and small game hunting.
Rob Boykin Wildlife Management Area	Washington Co., Ala.	21,645 acres; big and small game hunting.
Demopolis Waterfowl Wildlife Management Area	Sumter Co., Ala.	6,070 acres; includes 4,000 acres of water.
State Owned or Managed Lakes		
Lake Lamar Bruce	Lee Co., Miss.	450 acres, includes 300 acres water; fishing, boat docks, beach, swimming, launch ramp, camping.
Lake Lowndes	Lowndes Co., Miss.	770 acres, includes 160 acres water; picnicking, beach, swimming, fishing, water skiing.
Monroe County Lake	Monroe Co., Miss.	191 acres, includes 111 acres water; picnicking, beach, swimming, water skiing, fishing, camping.
Oktibbeha County Lake	Oktibbeha Co., Miss.	700 acres; fishing boating, water skiing, camping.
Lamar County Fishing Lake	Lamar Co., Ala.	127 acres land, 68 acres water.
Marion County Public Fishing Lake	Marion Co., Ala.	343 acres land and 37 acres water.
Washington County Fishing Lake	Washington Co., Ala.	161 acres land, 84 acres water.
Archaeological and Historical Sites		
Natchez Trace Parkway	Northeast Miss.	Historical parkway - scenic drive, picnicking, historical markers.
Cave Springs	Tishomingo Co., Miss.	Palcozoic rock area.
Brice's Cross Roads National Battlefield Site	Lee Co., Miss.	Civil War battlefield.
Tupelo National Battlefield	Lee Co., Miss.	Civil War battle site.
Stephen D. Lee House	Lowndes Co., Miss.	Antebellum home.
Sam Dale Memorial State Park	Lauderdale Co., Miss.	Historical site.

Source: River Basin Survey Staff, United States Department of Agriculture.

Table 4.13. Supply and demand for selected outdoor recreation activities, Tombigbee River Basin, 1970

Activity	Supply	Demand	Needs
	Activity occasions		
Swimming	1,550,165	4,080,456	2,530,291
Picnicking	1,579,920	2,669,612	1,089,692
Water-skiing	275,625	318,867	43,242
Boating	3,284,064	1,355,046	0
Hiking	1,035,654	92,819	0
Camping	461,525	591,107	129,582
Total	8,186,953	9,107,907	3,792,807

Source: Economic Research Service and Soil Conservation Service, United States Department of Agriculture.

guns, ammunition, bows, arrows, clothes, food, gas, lodging, dogs, and innumerable accessories create a tremendous flow of money from consumers to small businesses.

Based on a $6.30[1/] expenditure per man-day, an estimated 6.2 million dollars were spent by basin fishermen in 1970. This is a relatively low cost recreation pursuit and yet its economic impact is forceful.

In 1970, hunters spent an estimated $8.9 million harvesting wild game. Deer, quail, and waterfowl were the most valuable crops harvested.

Hunting and fishing combined produced expenditures of $15.1 million. This is an average of $103 per licensed hunter or fisherman.

1/ 1970 National Survey of Fishing and Hunting, Fish and Wildlife Service, United States Department of the Interior.

Present Environmental Situation

Environment is defined as the aggregate of surrounding things, conditions, or influences. It may be categorized as comprising two distinct entities--natural and man-made. The natural entities are those devoid of man; land forms, water bodies, ecosystems, and all others subject to alteration through natural phenomena. The man-made entity consists of cities, factories, farmlands, parks, canals, and other features representative of man's society.

Society has the physical and technological capability to alter the environment--for better or for worse. Because of the freedom of choice in the past, society more often than not elected to satisfy economic and social demands without due regard to such actions on the natural environment. This approach was generally accepted since the supply of water and related land resources was more than adequate for the satisfactory fulfillment of most demands. However, some resources are dwindling because of expanding and competing uses and solutions to problems can and are creating more problems.

The basin is well endowed with an adequate quantity and quality of land resources commensurate with existing demands. Approximately 66 percent of the total land area is in forests, 14 percent is in crops, 15 percent is in pasture, and 5 percent in all other land uses which includes urban uses.

There are three major land resource areas (LRA's) in the basin (map 5.3). The Alabama and Mississippi Blackland Prairie (LRA 135) occupies a crescent-shaped slice through the middle portion of the basin. This LRA comprises 27 percent of the total land and water base. Approximately 40 percent of this area is in pasture, 30 percent in crops, 28 percent in forests, and 2 percent in other uses. The area is gently undulating to flat in topography and was originally a natural grassland prairie. There are very few large timbered tracts in the area and few or no unaltered tracts remaining. Along roadsides and fence rows are found such tree species as osageorange, hackberry, red cedar, and elm. Cottonwood, sycamore, black willow, and deciduous holly are typically found along streams. Some land has been planted to loblolly pine for plantation management.

The Southern Coastal Plain (LRA 133) is hilly and heavily forested. This LRA comprises 71 percent of the total land and water base. Approximately 12 percent of this area is in crops, 10 percent in pasture, 77 percent in forests, and 1 percent in other uses. It may be noted that 91 percent of all basin forestland is in this LRA. Forest species composition is more diverse than in other LRA's. Common bottomland hardwoods are water oak, willow oak, cherrybark oak, swamp chestnut oak, several species of hickories, sweetgum, cypress, and river birch. Upland stands commonly include loblolly, shortleaf, and slash pine associated with upland oak species and hickories. Post oak and blackjack oak

are poor site indicator species. White oaks and southern red oaks are better site indicator species.

There are large tracts of forestland in the lower parts of LRA 133. Timber companies own much of this land. Considerable land conversion from mixed hardwood-pine stands to pine for pulpwood has occurred. Some bottomland hardwood stands have been clearcut and the land planted to soybeans.

The Sand Mountain (LRA 129) is found in a small portion of the northeast corner of the basin. This LRA comprises two percent of the total land and water base. Most of the acreage is forested with hardwoods or Virginia Pine. Soils are well suited to trees and except for small areas, are not suited to cultivated crops. Pulp and paper companies and individuals own large tracts of timberland. Farming is a part-time enterprise.

Small scattered areas of the Gulf Coast Flatwoods (LRA 152) occur in the extreme southern portion of the basin. This LRA comprises less than one percent of the land and water base. Relief varies from a few feet to 10 to 20 feet above sea level. Approximately 90 percent of the land is forested.

Portions of the basin offer outstanding scenic resources. The eastern side is very hilly and heavily forested. There are many ridge-top roads offering scenic vistas. Cypress swamps located along the Tombigbee River are typical of the old south swamplands.

Although the overall environmental quality of land and the landscape is good, there are problems that exist and lower environmental quality of local areas.

Lack of diversity in the prairie section creates a monotonous landscape of open fields with little tall vegetation for relief. Mining of mineral resources such as gravel, coal, lignite, and clay create unsightly land sores. Clearcutting of forest resources and reforesting to large areas of pine tend to develop even age stands of pines which are considered by some to be monotonous and biologically sterile areas.

The basin has an abundant amount of surface water. There are approximately 75,560 surface acres of water distributed throughout the basin. There are 18,296 acres of large water which is made up of water areas 40 acres or more in size. There are 57,264 acres of small water which is made up of water areas ranging in size from 2 to 39 acres. Many small ponds less than two acres and small streams are not included in the surface acreage.

Large water is primarily the sum of the acreage in a few large reservoirs and impoundments on rivers. The reservoirs include Bluff Lake, Loakafoma Lake, Lake Demopolis, and Dalewood Shores Lake. River impoundments include Coffeeville Lock and Dam, Sunflower Cutoff, Lock No. 1

Cutoff, and Three River Lake. Large water bodies are not equally distributed throughout the basin. Washington County, Alabama has over 6,000 acres, yet several counties to the north do not have adequate large water bodies for certain types of water contact sports.

The major rivers are Noxubee, Tombigbee, Buttahatchee, Sipsey, Luxapalila, Sucarnoochee, and Little River. These comprise about 750 miles of flowing rivers. Basinwide, streams with two to five square miles of drainage area exhibit perennial characteristics. In the Blackland Prairie, drainage areas exceeding five to ten square miles or more are required to produce perennial streams.

In general, the quality of surface water is good. There are some generally localized problems associated with solid waste, animal waste, pesticides, and sediment pollution.

In addition to providing fishery resources, the basin streams are important for scenic and aesthetic purposes. Many are natural and create scenic views as they flow from upland forests through pastures, crop fields and into deep bottomland hardwood forests. The northeastern portion of the basin supports very scenic mountain type streams. The upper reaches of Buttahatchee River and Bull Mountain Creek are examples.

No inventories have been made of wetlands in the Tombigbee River Basin. However, types 1-7, as described in Wetlands of the United States, Fish and Wildlife Service Circular 39, are found in the basin.

Those most important to fish, wildlife and environmental values are types 1, 3, 4, 5, 6, and 7. With the exception of type 1, these are permanent water areas generally located in overflow bottomlands in conjunction with bottomland hardwood forests. Water depth and aquatic vegetation present are important criteria used to determine the type of wetland.

Most of these wetland areas occur along the mid to lower reaches of the major streams and rivers in the basin. These flood plains provided suitable topography for the development of depressions and meanders, which allowed the eventual progression to some wetlands. Common wetlands in these areas are cypress sloughs, old shallow oxbow lakes, and beaver ponds.

Some wetlands are located in smaller stream bottoms and in cropland areas. These are primarily due to beaver activity. Many of these are not associated with woodlands, as are those in the lower reaches of the major streams.

Projections Related to Specific Components

Land Use

Land-use projections for the basin were developed through the use of a least-cost linear programming model and are based upon the assumptions and requirements outlined by 1972 Series C OBERS. The model provided estimates of land requirements, gross returns, costs of production, and land-use shifts for each of six major crops. Projections were made for the years 1990 and 2020.

In order to make the model operative, information concerning the present resource base and current cropping patterns was required, along with crop yields and cost of production data. The 1967 Conservation Needs Inventory (CNI) was used to provide data on land availability and land use for the base period (1970). Soils in the basin were classified into soil productivity groups (SPG's), and yield estimates and costs of production were developed for each SPG for each of the six major crops. There were 29 soil classifications (SPG's) in the Alabama portion of the basin and 28 in Mississippi. Soil groupings were based on productivity as well as the degree of hazard associated with a given soil series.

In order to project future conditions, estimates of future yields and costs of production were utilized. Yields for each of the soil groups were developed and checked against county estimates of acreage and output provided by the Statistical Reporting Service. Utilizing the base period yield data, projected yields by SPG for 1990 and 2020 were developed.

Costs of production were estimated from budgets prepared by USDA in cooperation with Auburn and Mississippi State Universities. Production costs were projected to increase at a rate of one percent on a constant basis for each of the six major crops. Both the yield and cost of production data assume an average level of on-farm management.

The future without plan conditions assume a continuation of current trends; i.e., no accelerated land and water resource development. Thus the model provided estimates of land use for 1990 and 2020 based on the current level of development and given the assumptions concerning yields and costs. Model runs using different yield factors were made to determine the sensitivity of the model to the yield projections. Additionally, changes in land use and gross returns by sub-basin were analyzed with an accelerated program of on-farm land treatment designed to reduce erosion and conserve the land base. The latter projections involved the imposition of additional costs (land treatment) to conduct and maintain conservation practices, as well as requiring a certain number of conservation acres to be set aside for water disposal and fallow land (rotation practice) per each 100 acres harvested.

Production requirements for the basin were developed from 1972 Series C OBERS projections for the years 1990 and 2020. They are based upon expected population and income growth--and hence demand. OBERS crop and livestock production requirements are not necessarily met on an individual crop basis--less production of some crops are allowed while more production of other crops are allowed. This assumption is predicated on the law of comparative advantage which permits shifts between the basin and the competing area--namely, all of Alabama outside of the basin.

The projections were adjusted to conform to the hydrologic boundary. This adjustment resulted in a reduction of the published OBERS figures, since the hydrologic basin does not include certain counties that constitute the Water Resources Subarea (WRSA) definition. In other cases, only part of a county may be included in the hydrologic basin.

Relationship to Objectives

The usefulness of the linear programming model derives from its capacity to help project land-use patterns under alternative sets of assumptions. It provides a means by which the process of selecting the most appropriate course of action is systematized. While data generated by the model for a specific area may require adjustment, it does give insight into the ability of the land and water resources in the basin to meet alternative levels of projected demand for food and fiber.

The demand for food and fiber production in the basin is expected to increase between 1990 and 2020. Accordingly, it will be necessary to (1) use existing resources in the basin more efficiently, (2) reallocate existing use patterns among cropland, pastureland, and forestland, or (3) some combination of both. The national economic development alternative assumes that increased efficiency, in the form of increased yields, can be achieved through an accelerated program of land treatment and conservation. Such a program would operate primarily through improved drainage, crop residue management, minimum tilling practices, and related means of reducing erosion and sediment problems.

The alternative to this program would involve increasing yields through the use of greater and greater amounts of fertilizer, pesticides, and related inputs. In view of the rising relative costs of such inputs, and their possible effects on the environment, installing and maintaining land treatment measures are likely to become more competitive. A problem arises when land treatment involves structural installations which require large capital expenditure initially, but provide benefits which accrue gradually over the years. To the extent that farmers are oriented to the short run, such measures would be slow to be adopted. Moreover, some of the benefits of the program would not accrue directly to those who install them, but would spill over as externalities to the

general population. Therefore, it would seem that motivating individual operators to install certain land treatment measures could be a serious problem.

Forest Demand - Supply Status

OBERS demands require a growth potential of 93 cubic feet per acre annually and the basin is capable of producing only 89 cubic feet per acre without accelerated resource development. Under present management trends and improved stocking, growth is projected to increase from 57.3 cubic feet per acre in 1970 to 78.2 cubic feet per acre by 2020 (figure 4.5). This will result in a deficit of 92 million cubic feet by 2020. To meet the projected demand in 2020, more than 100 percent of the inherent growth potential is required. Therefore, the demand in 2020 cannot be met unless forest acreage is increased or the inherent growth capacity of the land is enhanced.

Poor utilization is also a factor that contributes to the supply deficit. This includes incomplete utilization of trees as they are cut in the forest and at the mills. These losses amount to about 27 cubic feet per acre annually or 40 percent of the total annual growth. By the year 2020, if the present trends continue, this loss is projected to decline by about 30 percent to 17 cubic feet per acre per year.

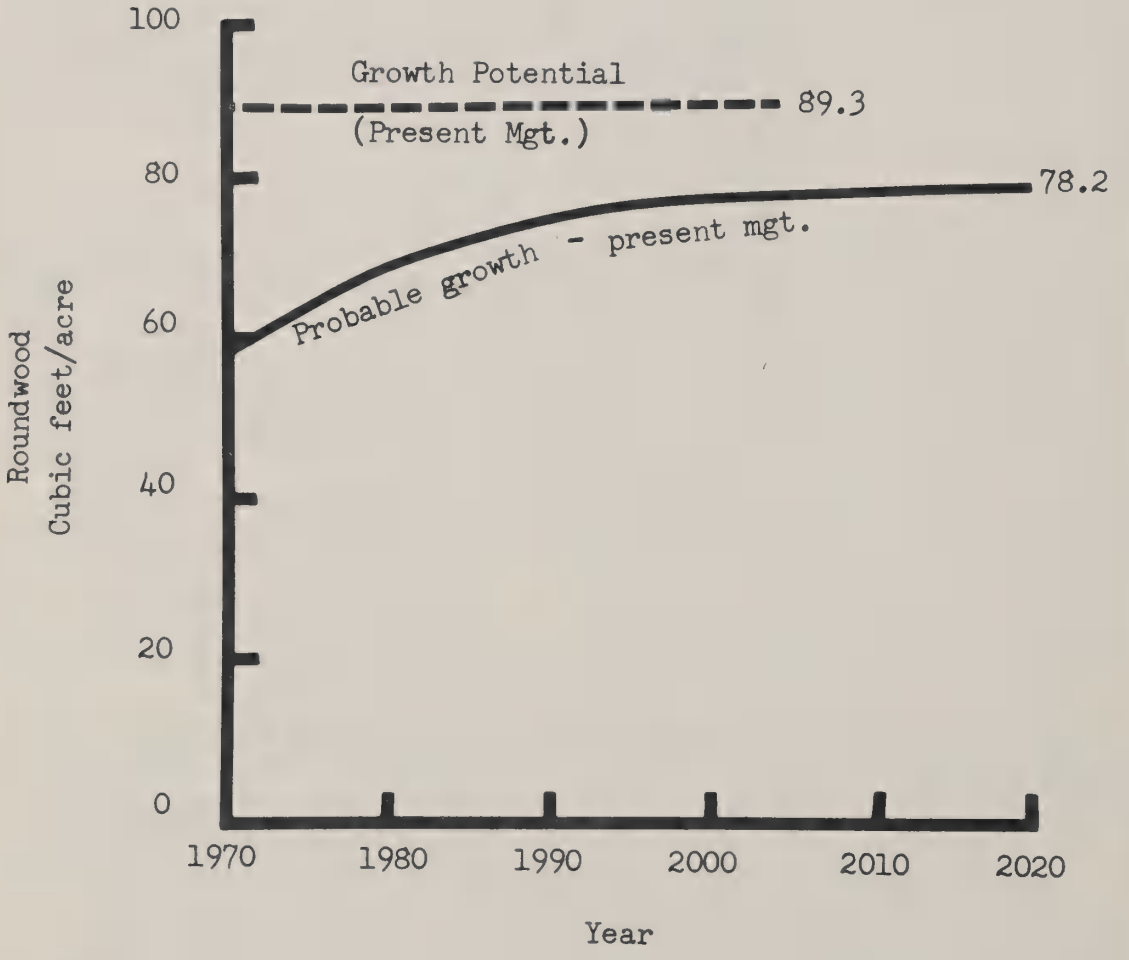
About one million acres of forest land are now used for grazing. This use is projected to decline to about 500 thousand acres by 2020. This decline is due to reduced grazing on 2.9 million acres of erodible soils and 1.2 million acres of bottomland hardwoods.

Agricultural Pollutants

Insecticides - Future insecticide use will depend upon research developments of chemical and possibly biological control. The actual impact of research is unknown; therefore, the projections applied are based on the geometric mean of the past application rates in Mississippi. The projected tabulations for insecticide application rates in pounds per acre are 15.41 in 1990 and the same amount in the year 2020. Based on the projected reduction of cotton acreage in the basin, insecticide use will decrease.

Animal Waste - The technical knowledge is available to solve the potential water pollution from confined and/or partial confined animals, but the primary obstacle is the financial resources of the farmers to install the systems. The annual cost data in table 4.14 may not appear to be astronomical, but to the small farmer, the cost of waste treatment and disposal may be the difference in profit or loss, especially when the market is down and feed prices are up. For a 500 head swine farmer, the annual cost of $1,790 (500 hd x $3.58/hd) is substantial.

Figure 4.5. Present and potential roundwood growth, Tombigbee River Basin, 1970 and projected 1990 and 2020



Source: Forest Service, United States Department of Agriculture

Table 4.14. Estimated annual cost of animal waste treatment for confined livestock, Tombigbee River Basin, 1970

Type livestock	Annual cost per head to control	
	Water pollution	Air and water pollution
	Dollars	Dollars
Dairy	13.02	34.00
Swine	3.58	10.86
Layers	0.10	0.85

Source: Soil Conservation Service, United States Department of Agriculture.

The Agricultural Stabilization and Conservation Service (ASCS) provides some financial assistance on installation. However, the cost sharing is presently limited to $2,500 per farm and applies only to permanent fixtures such as earthwork. No cost sharing is presently available for pumps and irrigation equipment. Additional funding is needed on a cost-share basis to reduce the initial fixed cost and thus the annual cost.

Under Public Law 92-500, Federal Water Pollution Control Act Amendments of 1972 , it is the National goal that the discharge of pollutants into the navigable waters be eliminated by 1985. The U. S. Environmental Protection Agency (EPA) is charged with administering the act. Also, the navigable waters have been interpreted by the courts to mean all waters of the United States.

EPA originally established a regulatory program for animal waste to apply to confinement units equal to or larger than 1,000 beef animal units or equivalent. This would eliminate almost all of the confinement units in this basin. Due to a court decision in 1975, the regulatory program and the standards completed by EPA in March 1976, will apply to "all" confinement facilities. The impact of the upcoming standards on future projections is uncertain on costs. Cost data in table 4.15 are based on the concepts that were applied to present conditions and assuming that all confined waste sources will be adequately treated.

Recreation

Recreation requirements for future time periods are shown in table 7.3 for selected activities in each planning and development district.

Table 4.15. Projections on animal populations and annual cost of waste treatment for water pollution control, Tombigbee River Basin, 1990 and 2020

Item	1990	2020
Beef:		
Population	1,275,600	1,573,500
Annual cost of waste treatment	1/	1/
Dairy:		
Population	28,400	18,500
Annual cost of waste treatment	$370,000	$241,000
Swine:		
Population	228,000	254,000
Annual cost of waste treatment	$816,000	$909,000
Poultry (broilers):		
Population	328,480,000	480,700,000
Annual cost of waste treatment	1/	1/
Layers:		
Population	13,500,000	18,700,000
Annual cost of waste treatment	$1,350,000	$1,870,000
Annual cost	$2,536,000	$3,020,000

Source: Soil Conservation Service, United States Department of Agriculture.

1/ Not applicable, adequate waste disposal with present production techniques.

Table 4.16 gives the land and water acreage needed to meet the needs of recreation seekers for selected recreation activities for present and future years.

Land and water requirements were adapted from space and use standards presented in the Alabama and the Mississippi Statewide Comprehensive Outdoor Recreation Plans. Requirements were based on per capita demand for each selected recreation activity.

There is an unmet demand for swimming, picnicking, and camping. There is a surplus supply of boating waters, water skiing waters, and hiking trails.

Swimming needs are primarily an expression of needs for suitable waters and facilities. There is plenty of water, but not enough beaches, swimming pools, and related facilities. Picnicking needs are primarily those for facilities. Land is available, but there aren't enough tables, trash receptacles, and fire places.

Most areas of the basin have an ample supply and adequate distribution of large water for boating and skiing. There are needs for more and better ramps and parking areas. Hiking has a low demand and thus shows a surplus of activity occasions with relatively few miles of trail.

Hunting and Fishing

Fish and wildlife resources of the basin are valuable and are a source of enjoyment for many of the basin residents. Overall, the quality of the resources is good and is not expected to deteriorate in the future.

Present and projected demand estimates for hunting and fishing are presented in table 4.17. Hunting demand is projected to increase from 1.8 million man-days in 1975 to 2.1 million man-days in 1990, and to 2.7 million man-days in 2020.

Currently, fishing demand is estimated at 991.2 thousand man-days. Projected demand is 1.2 million man-days in 1990 and 1.6 million man-days in 2020.

Scenic, Historic, Archaeological, and Ecological

Inventories of scenic, historic, archaeological, and ecological areas have been conducted in recent years. Present classification criteria of what qualifies as one of these types of areas are vague. As time progresses more concern will emerge for preservation of natural and historic elements of our society. By the year 1990 and 2020,

Table 4.16. Land and water requirements for specified recreation activities, Tombigbee River Basin, 1970 and projected 1990 and 2020

Item	Mississippi					Alabama				
	Planning and development districts				State	Planning and development districts			State	Basin
	2	5	6	8	Total	1	2	6	Total	Total
Swimming										
Water acres										
1970	1.9	12.3	11.3	3.0	28.5	2.5	7.0	8.7	18.2	46.7
1990	2.4	15.5	14.3	3.8	36.1	3.0	8.3	10.2	21.5	57.6
2020	3.1	19.8	18.3	4.9	46.1	3.8	10.6	13.1	27.5	73.6
Land acres										
1970	9.6	61.3	56.6	15.1	142.6	12.7	35.2	43.7	91.6	234.2
1990	12.1	77.6	71.6	19.1	180.4	14.8	41.3	51.1	107.2	287.6
2020	15.4	99.2	91.6	24.5	230.7	19.0	52.8	65.5	137.3	368.0
Picnicking										
Land acres										
1970	13.0	85.0	78.0	24.0	200.0	10.0	29.0	36.0	75.0	275.0
1990	17.0	107.0	99.0	26.0	250.0	12.0	33.0	42.0	87.0	337.0
2020	21.0	137.0	127.0	34.0	319.0	15.0	43.0	53.0	111.0	430.0
Waterskiing										
Water acres										
1970	288.0	1,847.0	1,706.0	456.0	4,297.0	386.0	1,072.0	1,331.0	2,789.0	7,086.0
1990	364.0	2,337.0	2,158.0	576.0	5,435.0	451.0	1,256.0	1,555.0	3,262.0	8,697.0
2020	465.0	2,991.0	2,763.0	738.0	6,957.0	578.0	1,608.0	1,992.0	4,178.0	11,135.0
Boating										
Water acres										
1970	799.0	5,122.0	5,633.0	1,263.0	12,817.0	830.0	2,308.0	2,865.0	6,003.0	18,820.0
1990	1,011.0	6,479.0	7,125.0	1,597.0	16,212.0	971.0	2,704.0	3,348.0	7,023.0	23,235.0
2020	1,291.0	8,295.0	9,120.0	2,048.0	20,754.0	1,243.0	3,462.0	4,288.0	8,993.0	29,747.0
Hiking										
Land acres										
1970	40.0	262.0	242.0	65.0	609.0	60.0	162.5	205.0	427.5	1,036.5
1990	53.0	330.0	305.0	82.0	770.0	70.0	192.5	237.5	500.0	1,270.0
2020	65.0	422.0	390.0	105.0	982.0	87.5	247.5	305.0	640.0	1,622.0
Camping										
Land acres										
1970	12.0	74.0	68.0	18.0	172.0	16.0	44.0	55.0	115.0	287.0
1990	15.0	94.0	87.0	23.0	219.0	19.0	52.0	64.0	135.0	354.0
2020	19.0	120.0	111.0	30.0	280.0	24.0	67.0	83.0	174.0	454.0

	1970	1990	2020
Basin total land requirements	1,832.7	2,248.6	2,874.0
Basin total water requirements 1/	18,835.6	23,254.2	29,764.9

Source: Adjusted from space standards in Alabama and Mississippi Statewide Comprehensive Outdoor Recreation Plans.

1/ Based on 66 percent of the demand for swimming water being provided for by swimming pools and boating totals providing for waterskiing also.

many old houses, buildings, and other sites will become historic and will be classified under some program carrying the authority to preserve the site for future generations. Presently, historical societies and commissions are working to include more of such areas under existing classifications for preservation. Projections of the numbers of sites by categories to be preserved by time frames are shown in table 4.18.

Table 4.17. Resident licensed demand for hunting and fishing, Tombigbee River Basin, 1970 and 1975, and projected 1990 and 2020

Item	Hunting		Fishing	
		Man-days		Man-days
Mississippi	1975	1,065,672	1970	613,800
	1990	1,243,645	1990	775,800
	2020	1,592,010	2020	991,800
Alabama	1975	758,736	1970	377,400
	1990	853,380	1990	443,700
	2020	1,092,960	2020	567,800
Basin	1975	1,824,408	1970	991,200
	1990	2,097,025	1990	1,219,500
	2020	2,684,970	2020	1,559,600

Source: Hunting demand adapted from Mississippi and Alabama mail surveys of game harvests, 1970-1974; fishing demand adapted from Mississippi and Alabama fishing license sales data, 1970.

Table 4.18. Projected numbers of scenic, historic, archaeological, and ecological sites to be inventoried, Tombigbee River Basin, 1990 and 2020

Item	Scenic	Historic	Archaeological	Ecological
	Sites	Sites	Sites	Sites
Mississippi				
1990	42	107	423	3
2020	56	125	478	3
Alabama				
1990	33	197	59	3
2020	44	230	66	3
Basin				
1990	75	304	482	6
2020	100	355	544	6

Source: Soil Conservation Service, United States Department of Agriculture.

Environmental Preferences

Both Alabama and Mississippi have identified desires and objectives that serve as a guide to the future development of water and land resources within each state. These desires and objectives that relate to the environmental resources of the Tombigbee River Basin are listed below.

Alabama

1. Water Quality - To conserve the waters of the state and to protect, maintain, and improve the quality of public water supplies, for the propagation of fish and wildlife, and for domestic, agricultural, industrial, recreational and other legitimate beneficial uses; to provide for the prevention, abatement, and control of new or existing water pollution; and to cooperate with other governmental agencies in carrying out these objectives.

2. Environmental - To encourage the efficient use of existing resources and the protection of the natural, scenic environment.

3. Fish and Wildlife - To encourage proper management of the fish and wildlife resources that will insure the best uses of these resources for the public good, both present and future, and to advocate reasonable action to protect and preserve endangered flora and fauna and the habitat that supports these organisms.

4. Recreation - To implement recreational programs that provide outdoor recreational opportunities; and to promote the state's scenic, recreational, and cultural facilities.

5. Land Use - To promote environmental quality through the adoption and enforcement of state standards to insure proper land use and pollution control.

6. Erosion - To encourage the formulation of programs to minimize erosion, including streambank problems caused by resource use.

Mississippi

1. Water Quality - To develop plans on a statewide basis to improve and strengthen water quality management and to insure that uniformity and consistency are maintained in the treatment of water quality problems.

2. Environment - To evaluate the need to protect, preserve, and improve archaeological, historical, cultural, and aesthetic features and to evaluate the impact of all proposed water and related land developments and policies upon such resources; to determine the impact of mineral, oil, and gas extraction upon the land and water resource base.

3. Fish and Wildlife - To develop plans that contribute to the satisfaction of the needs to protect, preserve, and improve the fish and wildlife resources within the state; to identify fish and wildlife habitats and evaluate opportunities for improvement and need for protection; to evaluate proposed water use and control measures on fish and wildlife resources.

4. Recreation - To develop plans to improve outdoor recreation opportunities; to evaluate the supply and demand for outdoor recreation and determine the suitability of potential recreation areas and their carrying capacities.

5. Land Use - To evaluate land use capability to provide a basis for appraising the availability, suitability, and productivity of land resources for recreation, wildlife habitat, aesthetics, urban development, agricultural pursuits, and other selected non-agricultural uses so that prime agricultural lands, ecologically significant areas, desirable open spaces, and areas suitable for urban expansion can be identified.

6. Erosion - To assess the relative contribution of all sources of sediment and to assess and recommend programs to reduce these yields; to determine the measures needed to reduce erosion and sediment damages and to determine the effects and costs of these measures.

How problems are solved and the way in which the demands are met will determine or direct the manner in which the quality of life and resources of the basin may be improved. Overall, the thrust of this study was to improve the quality of life in the basin. Three major items that encompass the desires and objectives of the states were paramount in the selection of alternative solutions to identified problems. These are a quality natural resource base for sustained use; quality environmental elements to provide attractive, convenient, and satisfying places for the basin residents to live, work, and play; and a quality standard of living for the basin residents based on community improvement and adequate income.

CHAPTER V

RESOURCE BASE AND EXISTING PROGRAMS

Resource Base

Location

The Tombigbee River Basin, as defined in this study, is located in Western Alabama and Northeastern Mississippi. It contains 8.8 million acres of land and water, with 4.9 million acres in Alabama and 3.9 million acres in Mississippi. The basin is part of a sub-region of the South Atlantic-Gulf Region.

All or part of 16 counties in Western Alabama and 19 counties in Northeast Mississippi are within the basin boundaries. Three Alabama counties, Lamar, Pickens, and Sumter; and five Mississippi counties, Clay, Lee, Lowndes, Monroe, and Noxubee, are entirely in the basin.

Climate

The climate is basically a temperate to subtropical one with abundant precipitation, generally influenced by the Gulf of Mexico to the south and the huge continental land mass to the north. Warm temperatures can be expected to begin in May and continue into September, with the summers being hot and humid. The remainder of the year is generally mild with freezing or sub-freezing temperatures occurring occasionally but seldom lasting more than several days at a time.

The prevailing winds are from the south or southwest during the spring and summer months. During the winter months, the prevailing winds are generally from the north or northwest.

Occasionally the basin is subjected to heavy general rains caused by various tropical disturbances or hurricanes moving inland from the Gulf of Mexico. However, the most intense rainfall in terms of inches per hour is not usually the result of tropical disturbances or hurricanes but rather local summer thunderstorms that can produce intense runoff and cause severe flood damage locally.

Rainfall is adequate for most agricultural needs. The mean annual precipitation ranges from about 62 inches in the extreme southern section to about 52 inches in the extreme northern section. Two areas--Starkville-West Point, Mississippi and Dancy-Livingston-Pushmataha, Alabama--have a mean annual precipitation of about 48 inches (see map 5.1).

October is usually the driest month with an average monthly rainfall of about 2.5 inches. March is usually the wettest month with an average monthly rainfall of about 6.2 inches. Although rainfall is generally adequate, there are times when droughts occur during the growing seasons. Relatively long periods with little or no rain are more likely to occur in late summer and autumn than at any other time.

The average annual temperature ranges from about 61.0° F. in the extreme northern part of the basin up to about 67.5° F. in the extreme southern part. Average low monthly temperatures in January range from about 41° F. in the northern part to about 52° F. in the southern part. Average high monthly temperatures in July vary from about 78° F. to 81° F.

The average length of the growing season ranges from 215 days in the extreme northern part to 275 days in the extreme southern part. Basin-wide, the average annual growing season is 232 days.

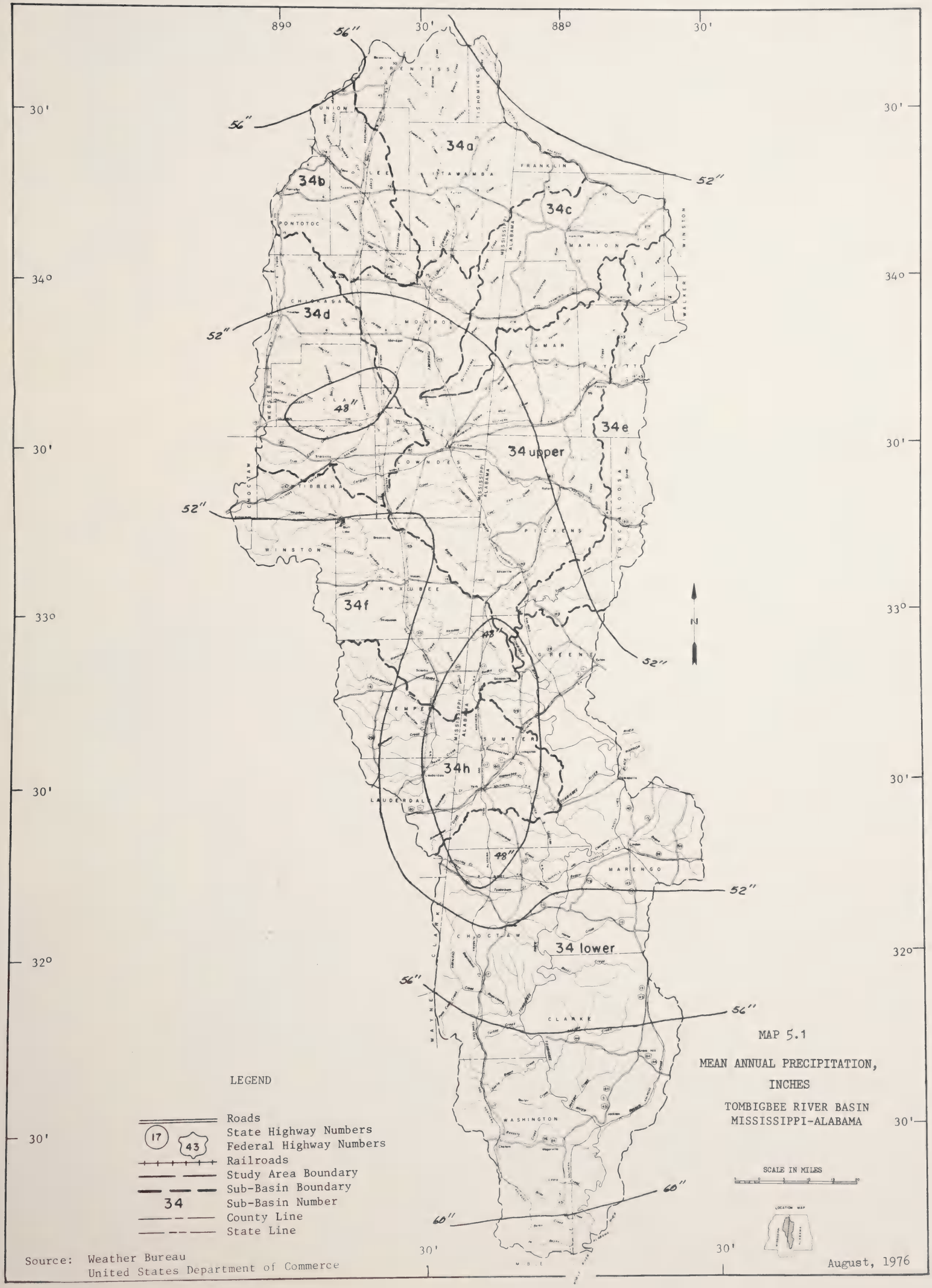
Physiography and Geology

The basin is divided into eight distinct physiographic districts. They cross northwest to southeast in crescent-shaped zones or belts. They are the Pine Hills, Lime Hills, North Central Hills (Southern Red Hills in Alabama), Flatwoods, Pontotoc Ridge (Chunnennuggee Hills in Alabama), Black Prairie, Fall Line Hills, and Cumberland Plateau.

The outcrop or surface exposure of the formations that make up the physiographic districts form northwest-southeast trending zones. The dip of the formations is to the west and southwest with the older formations being under the younger ones. The geology map shows the groups and formations which compose them (map 5.2).

The Pine Hills district is a maturely dissected highland and the surface slopes from an elevation of 400 feet on the north to about 100 feet at the southern margin. Into this upland, streams have carved valleys converting the original slightly inclined plain into a region of hill slopes. Underlying geologic materials are: unconsolidated beach, floodplain, and terrace deposits (Recent); sands and clays, locally indurated, of the Hattiesburg, Chipola, and Catahoula formations of the Grand Gulf Group (Miocene Age); calcareous sand, clay, gravel, marlstone, and impure limestone of the Byram, Glendon, Marianna, and Red Bluff formations of the Vicksburg Group (Oligocene Age); and calcareous clay and soft limestone of the Yazoo, Ocala, and Moody's Branch formations of the Jackson Group (Eocene Age).

The Lime Hills is a belt of rugged topography approaching that of the Southern Red Hills. It is caused partly by the reappearance of the highly resistant Tallahatta Formation in the Hatchetigbee anticline and partly by facies changes from soft clay, sand, and marl to resistant



Source: Weather Bureau
United States Department of Commerce

LEGEND

- Roads
- (17) (43) State Highway Numbers / Federal Highway Numbers
- Railroads
- Study Area Boundary
- Sub-Basin Boundary
- 34 Sub-Basin Number
- County Line
- State Line

89° 30' 88° 30'

34° 30' 33°

34a 34b 34c 34d 34e 34f 34g 34h 34 upper 34 lower

Age		Group	Formations
Recent			Alluvial & terrace deposits
Miocene		Grand Gulf	Hattiesburg, Chipola Catahoula
Oligocene		Vicksburg	Byram, Glendon, Mariana Red Bluff
Eocene		Jackson	Yazoo, Ocala Moodys Branch
		Claiborne	Gosport, Lisbon, Tallahatta
		Wilcox	Hatchetigbee, Bashi, Tuscahoma, Nanafalia
Paleocene		Midway	Naheola, Porters Creek, Clayton
Upper Cretaceous		Selma	Prairie Bluff, Ripley
			Demopolis, Mooreville, Coffee Sand (Blufftown)
		Eutaw	Eutaw
			McShan
		Tuscaloosa	Tuscaloosa Gordo Coker
Pennsylvanian			Pottsville

Source: Modified from Geologic Map of Mississippi, Mississippi Geological, Economic and Topographical Survey and Geologic Map of Alabama, Geological Survey of Alabama.

Map 5.2

GEOLOGY MAP
TOMBIGBEE RIVER BASIN
MISSISSIPPI-ALABAMA

SCALE IN MILES

August, 1976

limestones in the Upper Eocene and Oligocene deposits. Substrata are comprised of sand, sandy marl, claystone, and resistant sandstone of the Gosport, Lisbon, and Tallahatta formations of the Claiborne Group (Eocene Age).

The North Central Hills district (Southern Red Hills in Alabama) is a large, wide highland belt of sand and clay. Stream action has cut deep valleys throughout the unconsolidated sands and clays of the Wilcox Group, thereby changing the once level plateau into an area of rough relief. In only a few scattered areas does the rather broad level remnants of the plateau surface remain. On both sides of the state line the uniformity of relief is interrupted by a cuesta-like outcropping of the resistant siliceous sandstones and clays of the Tallahatta Formation (Buhrstone Hills in Alabama). Substrata consist of sands, silts, clays, and marl of the Hatchetigbee, Bashi, Tuscahoma, and Nanafalia formations of the Wilcox Group (Eocene Age).

The Flatwoods is a flat-lying relatively smooth surface developed on the massive clay of the Porters Creek Formation and thinly laminated silts and clays of the Naheola Formation. Underlying materials are mainly clays of the Midway Group (Paleocene Age), Porters Creek (Sucarnoochee), and Naheola formations.

The Pontotoc Ridge (Chunnennuggee Hills in Alabama) is a broad high range that has been deeply dissected by stream action into a series of hills and valleys. This zone is strongly coincident with the Ripley and Prairie Bluff formations and is a continuation of the Chunnennuggee Hills in Alabama which is a complex cuesta facing northward. It is one of the most striking surface features of the Southern Coastal Plain. Substrata are chalk, clay, and sandy chalk of the Prairie Bluff and Ripley formations of the Selma Group (Upper Cretaceous).

The Black Prairie is a crescent-shaped strip of level to undulating terrain underlain by formations of the Selma Group. In Alabama and the southern part of the region in Mississippi, the broad prairie plains are dominant to the point of being almost continuous with only low ridges separating watersheds. In the north the plain tapers to a width of approximately six miles. The interfluvial areas are higher and the prairie features are much less common in the north. Underlying geologic materials are mainly marl, sandstone, sand, clay, and limestone of the Demopolis, Mooreville, and Coffee Sand (Blufftown) formations of the Selma Group (Upper Cretaceous).

The Fall Line Hills is a maturely dissected highland area in the northeastern part of Mississippi and the northwestern part of Alabama. The area marks the contact between the older and more or less indurated rocks of the Appalachian upland and the less resistant formations of the Gulf Coastal Plain. The hills are underlain by the more or less resistant Eutaw and Tuscaloosa sands, gravels, and clays. The area presents the aspect of a complex cuesta system and includes the divide between the

Tennessee and Tombigbee drainage systems. Substrata consist of sand, silt, gravel, and clay of the Eutaw and McShan formations of the Eutaw Group (Upper Cretaceous) and the Tuscaloosa Formation of the Tuscaloosa Group (Upper Cretaceous). Some lignite is also found in the Tuscaloosa Group.

The Cumberland Plateau is a rugged area of nearly flat-lying rocks that border the mountains on the west. For the most part, this area is intricately dissected by stream valleys forming a dendritic or tree-like pattern. Most of the streams have very crooked, meandering courses. The Cumberland Plateau coincides in general with the areas of the Pottsville Formation (Pennsylvanian) in Alabama.

Major Land Resource Areas and Soils

The basin lies entirely within the South Atlantic-Gulf Water Resources Region and is composed of three major land resource areas (see map 5.3). They are the Southern Coastal Plain (LRA 133), the Alabama and Mississippi Blackland Prairies (LRA 135), and the Sand Mountain (LRA 129). In addition, small scattered areas of the Gulf Coast Flatwoods (LRA 152) exist in the extreme southern portion of the basin but are not shown on the land resource area map.

The Southern Coastal Plain comprises 71 percent of the basin. As the name indicates, the soil materials are of Coastal Plain origin and are made up of sands, clays, shale, and some gravel. Many different materials are exposed in the area and their varying resistance to erosion has created a complex topography. From these materials, many soils and landforms have developed.

The topography varies from level to steep. The steep land and much of the rolling land is better suited for forests than for cultivated crops. There are many farms located on the better drained bench and bottomland soils and these farms usually produce moderately high yields of all crops.

Most of the soils are acid, low in native fertility, and vary from sandy to clayey in texture. Included among the major soils of the Coastal Plains are soils of the Savannah, Ora, Stough, Sweatman, Boswell, McLaurin, Ruston, Smithdale, Luverne, and Troup series (Udults) 1/ in the uplands and Jena, Chewacla, and Kirkville (Ochrepts), Cahaba (Udults), Myatt (Aquults), Mantachie, Arkabutla, and Rosebloom (Aquents), Ochlockonee and Iuka (Fluvents), and Urbo (Aquepts) on the floodplains and stream terraces. Other Coastal Plains soils found in local areas within the basin include Lucy, Saffell, Prentiss, Orangeburg, Red Bay,

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1/ Classification is at the suborder level of the Comprehensive Soil Classification System.

89° 30' 88° 30'

30' 34° 30' 33° 32° 30'

LEGEND

- Roads
- (17) (43) State Highway Numbers / Federal Highway Numbers
- Railroads
- Study Area Boundary
- Sub-Basin Boundary
- 34 Sub-Basin Number
- County Line
- State Line
- Land Resource Area Boundary
- 129 Land Resource Area Number

MAJOR LAND RESOURCE AREAS

129	SAND MOUNTAIN
133	SOUTHERN COASTAL PLAIN
135	ALABAMA AND MISSISSIPPI BLACKLAND PRAIRIES

Source: Soil Conservation Service, United States Department of Agriculture

Map 5.3

LAND RESOURCE AREA MAP

TOMBIGBEE RIVER BASIN
MISSISSIPPI-ALABAMA

SCALE IN MILES

August, 1976

Dothan, Flomaton, Lucedale, Esto, Malbis, Escambia, and Quitman (Udults), Atwood, Providence, Longview, Falkner, and Wilcox (Udalfs), Adaton and Mayhew (Aqualfs), and Trebloc and Smithton (Aquults).

The Alabama and Mississippi Blackland Prairies comprises 27 percent of the basin. This land resource area has soft limestone or chalk underlying most soils. This chalk or marl has served as parent material for the upland soils. Soils developing from such materials tend to be very clayey. Such soils are tough, sticky, and difficult to work, have high shrink-swell properties, and require special management practices for cultivated crops.

The lay of the land ranges from level to sloping with most land on gentle relief. This predominance of gentle slopes is favorable for the establishment of the large pastures, meadows, and fields which are evident in the present agriculture of the Blacklands areas. The floodplains or bottomlands tend to be broad and flat in comparison with bottomlands in other areas. As a result of these conditions, frequent floods occur and poor agricultural drainage of bottomlands is a major problem. These bottomlands are important to agriculture and the economies of the Blackland areas because most of the soils have high production potentials.

Soils of this land resource area include Kipling, Oktibbeha, and Vaiden (Udalfs), Okolona and Houston (Uderts), Demopolis (Orthents), and Sumter (Ochrepts), on the uplands and Leeper (Aquepts), Catalpa (Udolls), and Griffith (Aquolls) on the floodplains. Some Wilcox, Mayhew, Boswell, and Susquehanna soils are included in the upland part of the Alabama portion of the Blackland Prairies Land Resource Area.

The Sand Mountain comprises approximately two percent of the basin. This plateau is dissected by many intermittent streams and a few permanent streams. Within the area are narrow ridgetops and valleys. Side slopes range from 15 to 50 percent. Shale and sandstone bedrock underlie the side slopes at depths of 6 to 25 inches and ridges at depths of 18 to 60 inches. Most of the acreage is forested with hardwoods or Virginia Pine. Soils are well suited to trees but are not suited to cultivated crops except for small areas. The soils on hillsides are low in fertility. They are shallow over bedrock and erode easily if cleared and cultivated.

Soils of the upland include the Townley, Enders (Udults) and Montevallo (Ochrepts). Sequatchie soils (Udults) are on low terraces.

Small scattered areas of the Gulf Coast Flatwoods occur in the extreme southern portion of the basin. These small areas are not shown on the basin map. They comprise less than one percent of the total basin area. Relief varies from a few feet to 10 to 20 feet above sea level. Approximately 90 percent of the areas are forested. A large part of the area has soils with restricted drainage. Major soils include the Dorovan (Saprists), Atmore and Plummer (Aquults), and Escambia, Poarch, and Malbis (Udults).

Land and Water Base

The basin consists of 8.8 million acres of land and water. These acres are categorized into agricultural land or inventory land, non-agricultural land or non-inventory land, and large water areas.

The basin's inventory land is made up of cropland, pastureland, forestland and other land for a total of 8.3 million acres. Federal land, urban and built-up areas, and small water areas make up the non-inventory land and total 460.0 thousand acres. Large water area totals 18.3 thousand acres and consists of lakes and reservoirs that exceed 40 acres in size and rivers and streams that exceed one-eighth mile in width.

Cropland totals 1.3 million acres or 14.5 percent of the total area. Pastureland totals 1.3 million acres or 14.5 percent. Inventory forestland totals 5.6 million acres or 64.1 percent of the basin. Urban and built-up areas total 259.8 thousand acres or 2.9 percent of the basin. The remaining 4.0 percent of the area consists of federal land, other land, and small and large waters (table 5.1).

Potentials for Land Use

The capability classes of soils indicate in a general way their suitability for most kinds of farming. These classes that range from Class I to VIII define the limitation for agricultural use and the general management requirements. Class I soils have few limitations whereas Class VIII soils have many limitations. The basin contains no Class VIII soils.

Land capability Classes I, II, III, and IV are suitable for cultivated crops. However, all classes except Class I have some limitations. Class II land can be cultivated most of the time but erosion and drainage present minor problems. Class III land is fairly suitable for cultivated crops but has some major problems and limitations. Class IV land can be cultivated part of the time but major problems and limitations are more severe.

The remaining three land capability Classes--V, VI, and VII--are not suitable for cultivated crops. These classes of land can be used for grazing or forestry. All of the land is suitable for wildlife and recreation use.

Table 5.2 presents the land capability classes for the basin's inventory of agricultural land by states and major land use. The basin contains 4.9 million acres of Class I through Class IV land. This represents 58.6 percent of the total inventory land. Of these 4.9 million acres, 65.5 thousand acres are Class I; 1.6 million acres are Class II; 1.5 million acres are Class III; and 1.7 million acres are Class IV lands. Presently, 1.1 million acres or about 24 percent of these four classes are cropland.

Table 5.1. Land and water, inventory and non-inventory, by state and sub-basin, Tombigbee River Basin, 1970

Land and water	State and total	Sub-basin 34 (Upper)	34 (Lower)	34a	34b	34c	34d	34e	34f	34h	Total
		Acres									
Inventory land	Total	1,541,034	2,623,774	719,689	415,849	545,304	634,119	486,684	757,675	600.637	8,324,765
Cropland	Miss.	161,645	5,528	177,278	210,567	12,932	148,229	-	103,769	33,120	853,068
	Ala.	63,916	181,163	13,223	-	64,589	-	57,248	21,512	18,220	419,871
	Total	225,561	186,691	190,501	210,567	77,521	148,229	57,248	125,281	51,340	1,272,939
Pastureland	Miss.	142,617	4,878	76,700	68,273	14,583	190,747	-	165,602	54,551	717,951
	Ala.	107,743	305,318	4,722	-	23,067	-	39,966	24,935	54,662	560,413
	Total	250,360	310,196	81,422	68,273	37,650	190,747	39,966	190,537	109,213	1,278,364
Forestland	Miss.	336,410	11,285	378,382	131,261	100,465	279,807	-	393,605	261,966	1,893,181
	Ala.	704,876	2,083,400	57,738	-	325,055	-	378,668	34,118	165,339	3,749,194
	Total	1,041,286	2,094,685	436,120	131,261	425,520	279,807	378,668	427,723	427,305	5,642,375
Other land	Miss.	12,870	434	10,702	5,748	-	15,336	-	11,689	9,742	66,521
	Ala.	10,957	31,768	944	-	4,613	-	10,802	2,445	3,037	64,566
	Total	23,827	32,202	11,646	5,748	4,613	15,336	10,802	14,134	12,779	131,087
Non-inventory land	Total	59,403	67,586	36,525	29,251	19,581	76,073	20,662	129,760	21,156	459,997
Federal land	Miss.	4,606	-	2,865	2,826	-	29,106	-	84,006	8,010	131,419
	Ala.	-	11,221	-	-	306	-	-	-	-	11,527
	Total	4,606	11,221	2,865	2,826	306	29,106	-	84,006	8,010	142,946
Urban & built-up	Miss.	27,596	1,185	25,540	22,003	3,251	39,849	-	38,037	5,862	163,323
	Ala.	14,537	42,209	2,139	-	13,617	-	19,149	1,170	3,643	96,464
	Total	42,133	43,394	27,679	22,003	16,868	39,849	19,149	39,207	9,505	259,787
Small water	Miss.	9,477	60	5,834	4,422	990	7,118	-	6,080	2,801	36,782
	Ala.	3,187	12,911	147	-	1,417	-	1,513	467	840	20,482
	Total	12,664	12,971	5,981	4,422	2,407	7,118	1,513	6,547	3,641	57,264
Large water	Miss.	975	-	2,295	547	-	1,012	-	1,703	2,175	8,707
	Ala.	415	8,989	60	-	125	-	-	-	-	9,589
	Total	1,390	8,989	2,355	547	125	1,012	-	1,703	2,175	18,296
Total	Miss.	696,196	23,370	679,596	445,647	132,221	711,204	-	804,491	378,227	3,870,952
	Ala.	905,631	2,676,979	78,973	-	432,789	-	507,346	84,647	245,741	4,932,106
	Total	1,601,827	2,700,349	758,569	445,647	565,010	711,204	507,346	889,138	623,968	8,803,058

Source: River Basin Survey Staff, United States Department of Agriculture.

Table 5.2. Land use by land capability class, states, and major land use, Tombigbee River Basin, 1970

Land capability class	State and total	Total agricultural land	Major land use				Distribution
			Cropland	Pastureland	Forestland	Other	
		One thousand acres					Percent
I	Miss.	6.9	4.4	1.1	1.4	0.0	0.09
	Ala.	58.6	20.2	12.9	22.9	2.6	0.70
	Total	65.5	24.6	14.0	24.3	2.6	0.79
II	Miss.	715.1	295.0	194.0	208.5	17.6	8.59
	Ala.	840.6	195.4	196.6	427.8	20.8	10.10
	Total	1,555.7	490.4	390.6	636.3	38.4	18.69
III	Miss.	877.0	298.6	206.3	352.3	19.8	10.54
	Ala.	660.2	102.7	101.0	439.3	17.2	7.93
	Total	1,537.2	401.3	307.3	791.6	37.0	18.47
IV	Miss.	837.9	173.0	157.9	491.3	15.7	10.06
	Ala.	885.4	58.5	100.6	715.5	10.8	10.64
	Total	1,723.3	231.5	258.5	1,206.8	26.5	20.70
I - IV Total	Miss.	2,436.9	771.0	559.3	1,053.5	53.1	29.27
	Ala.	2,444.8	376.8	411.1	1,605.5	51.4	29.37
	Total	4,881.7	1,147.8	970.4	2,659.0	104.5	58.64
V	Miss.	78.9	3.5	0.0	75.1	0.3	0.95
	Ala.	596.9	6.0	45.1	544.5	1.3	7.17
	Total	675.8	9.5	45.1	619.6	1.6	8.12
VI	Miss.	361.3	48.0	118.3	188.7	6.3	4.34
	Ala.	430.3	22.2	59.3	342.5	6.3	5.17
	Total	791.6	70.2	177.6	531.2	12.6	9.51
VII	Miss.	653.7	30.6	40.4	575.9	6.8	7.85
	Ala.	1,322.0	14.8	44.9	1,256.7	5.6	15.88
	Total	1,975.7	45.4	85.3	1,832.6	12.4	23.73
V - VII Total	Miss.	1,093.9	82.1	158.7	839.7	13.4	13.14
	Ala.	2,349.2	43.0	149.3	2,143.7	13.2	28.22
	Total	3,443.1	125.1	308.0	2,983.4	26.6	41.36
I - VII Total	Miss.	3,530.8	853.1	718.0	1,893.2	66.5	42.41
	Ala.	4,794.0	419.8	560.4	3,749.2	64.6	57.59
	Total	8,324.8	1,272.9	1,278.4	5,642.4	131.1	100.00

Source: Adapted from Alabama and Mississippi Conservation Needs Inventories, 1967, Conservation Needs Committees.

In addition, the basin contains 3.4 million acres of Classes V through VII land. This is 41.4 percent of the basin's inventory land. As indicated above, this land is best suited for uses such as grazing, forest, wildlife, and recreation.

Mineral Resources

Sand and gravel constitute major commodities mined in the basin. Immense quantities of quartz sand are present in various intervals throughout post-Paleozoic sediments that form the bedrock. The principal source of gravel from sedimentary strata is the Tuscaloosa Formation of the Cretaceous system. Terrace and alluvial deposits also furnish abundant gravel.

The coal-producing area is in northern Alabama and is divided into the Plateau and Warrior coal fields. These fields comprise the southernmost part of the Eastern Coal Province. The coal is removed by strip mining.

Lignite is a low-rank fossil fuel, and large reserves occur in the Naheola Formation and Wilcox Group of Mississippi and Alabama. The quality of the lignite is generally good. No large scale mining has taken place although large areas have been leased for future strip mining operations.

Clay and clay mixtures abound in the surface strata. Chalk or clay for use as cement raw material and as agricultural soil conditioners occur in the Selma Group of the Cretaceous Age. The other principal types of indurated clays include ball clay, bentonite, fire clay, fuller's earth, kaolin, and miscellaneous clays (such as brick).

Much of the basin has good potential for the production of oil and gas. Relatively large oil and gas reserves are located in Alabama in the southern portion of the basin and smaller gas reserves in a few northern counties. An abandoned gas field in Monroe County, Mississippi, has been renovated and is utilized as a natural gas storage facility. See table 5.3 for a listing of minerals produced and their estimated value.

Scenic, Historic, and Archaeological

A compilation of scenic, historic, archaeological, and ecological sites is shown in tables 5.4 and 5.5. This compilation was made from existing inventories of agencies, commissions, and local groups. There are many historic, scenic, and archaeological sites still remaining in the basin. Many Civil War battles, Indian happenings and folklore occurrences have been recorded and assigned to a house or site. The compilation is not complete; however, it does contain significant sites. This listing emphasizes the importance of preserving this portion of our historic past.

Table 5.3. Value of mineral production, by state and county, Tombigbee River Basin, 1972 1/

State and county	Value	Minerals produced in order of value
	1,000 dollars	
Alabama:		
Choctaw	4,551	Petroleum
Clarke	1,300	Sand and gravel, petroleum
Fayette	0	None reported
Franklin	3,578	Stone, iron ore, sand and gravel, clays
Greene	0	None reported
Hale	25	Sand and gravel
Lamar	12	Petroleum
Marengo	4,520	Cement, stone
Marion	3,260	Coal, clays, sand and gravel
Mobile	36,325	Petroleum, cement, stone, sand and gravel, natural gas liquids, clays
Pickens	0	None reported
Sumter	535	Clays, sand and gravel
Tuscaloosa	16,927	Coal, sand and gravel, iron ore
Walker	59,698	Coal, clays
Washington	880	Stone, salt, sand and gravel
Winston	2,070	Coal
Mississippi:		
Chickasaw	0	None reported
Choctaw	0	None reported
Clarke	38,624	Petroleum, natural gas, natural gas liquids
Clay	671	Sand and gravel, natural gas, stone
Itawamba	607	Clays, natural gas, sand and gravel
Kemper	43	Clays
Lauderdale	25	Clays
Lee	35	Clays
Lowndes	1,620	Sand and gravel, clays
Monroe	3,276	Clays, sand and gravel, natural gas, petroleum
Noxubee	393	Clays, stone, sand and gravel
Oktibbeha	11	Natural gas
Pontotoc	0	None reported
Prentiss	15	Clays
Tippah	2,225	Clays
Tishomingo	200	Sand and gravel, stone
Union	0	None reported
Webster	0	None reported
Winston	59	Clays
Total	181,485	

Source: Geological Survey of Alabama and Mississippi Geological, Economic and Topographical Survey. Estimates made where information was withheld to avoid disclosing individual company confidential data. Iron ore no longer produced in Alabama.

1/ Estimates for whole counties and not that county portion within the hydrologic boundary.

Table 5.4. Scenic, historic, archaeological and ecological areas, Alabama portion, Tombigbee River Basin, 1974

County	Natural and Scenic	Historic 1/		Archaeological	Ecological Communities
Franklin	-	-		5	-
Marion	Rideout Falls and Williams Creek	Bexar Community		2	
	White Rock and Buttahatchie River	Ford Mill			
	State Rock and North Fork Creek	Pearces Mill			
Lamar		Bankhead Home (NR) (HABS)	Dug Hill	-	
		United Confederate Veterans Monument	Old Stage Coach Inn		
Fayette	Sipsey River Swamp	McCaleb Water Mill	Indian Hunting Grounds	1	
		McConnel Home	Gilliam Home		
		Whitney Home	Darden-Taylor-Gibson Home		
		Payne House	Pleasant Hill Cemetery		
		South (J. R.) House	Yerby-Gibson House		
Winston	Natural Bridge			2	
Tuscaloosa		Cooper-Dorrah Home	Dorrah Home	2	
		Cooper (Francis) Home	Cooper (John) Home		
		Cooper-Skelton Home	Guin House		
		Mayfield-Stine-Springer House	Mayfield-Martin Log House		
		Montgomery Log Cabin	Price-Holmon House		
		Sullivan-Skelton Log House	White-Sullivan Log House		
Pickens	13 Spout Artesian Well	Bethemy Cemetery	Windle Home	5	
	Pickensville Boat Landing	Long Home	McShan Home		
		Old Jail (Gordo) (NR)			
Clarke	Stimpson Sanctuary	Oven Bluff	Fort Sinquefield (NR)	-	
	Forks of Rivers Swamp	Cleveland Home	Fort Corney		
	Tombigbee and Bashi Creek Picnic Area	Fort Easley	Fort Glass		
		Fort Gullett	Goodman Home		
	Virgin Longleaf Pine Stand	Landrum's Fort Site	McGrews Fort Site		
	Bassetts Creek	Motts Fort Site	Salt Works		
		Mt. Nebo Baptist Church and Cemetery	York Mansion		
		Ocher Mine			
Choctaw		Bryan Marsh Home	Tuscahoma Landing	4	
		Dicks Home	Oakchia		
		Cedar Hill	Swann House		
		Bladon Springs Methodist Church	Dubose Log Cabin		
		Brittons	Ezell Home		
		Guilder Home	Holcomb Home		
		Chestnut	Land Home		
		Jackson Home	McCalls		
		Little Page Home	Mills Home		
		Marshwood	Phillips Home		
		Parker Ford Home	Singley Home		
		Rogers Log Cabin	Turner Home		
		Stanfords Home	Wilson Log Cabin		
Sumter		Lakewood	Board Well Pavillon	8	China Bluff
		White Home	Fort Tombeebee (NR)		
		Ennis Home	General Forest Monument		
		John A. Rogers Home	Old Confederate Cemetery		
		Long Home	Oak Manor		
		The Cedars	Confederate Monument		
		Louden	Aduston Hall		
		Burton Home	Bailey Home		
		Houston Home	Coffin House		
		Dial Dodges Home	Sumter County Courthouse (NR)		
		Fairview	Garth Home		
		Harris-White Home	Henson Home		
		Hawkins House	White House		
		Little House	Lee Haven		
		The Magnolias	Wire Road		
		Winston Plantation	Moses Lewis Home		
		Myrtle Grove	Rooster Bridge		
		Quilby	Rogers Home		
		Schifman Home	Shell		
		Spidle Home	Steele Home		
		Taylor Home			
Marengo	White Bluffs (NR)	Gaineswood (NR)	Bluff Hall (NR)	-	
	Whitfield Canal	Old Court House (NR)	Glover Mausoleum (NR)		
	Foscue Creek Park	Foscue-Whitfield House (NR)	George House		
		McDowell-Creaghhand House	Cedar Haven		
		Half-Chance Bridge (NR)	Lyon-LaMar (NR)		
Washington	Lime Quaries	Old St. Stephens (NR)	New St. Stephens	13	
	McIntosh Bluff	McIntosh Methodist Church	Chestang River		
	Healing Springs	Fort McGrew	Fort Republic		
	Reynolds Cave	Griffith Home	Gum Springs Tavern		
	Limestone Areas	Jones Home	McIntosh Bluff Site		
	Wet Flat Areas	McIntosh Log Church (NR)	Rankins Fort Site		
	Tombigbee Swamp	Salt Mines	Williams Home		
Greene		Rosemount (NR)	Thompson-Taylor Home	9	
		Barnes Sterling House	Westmoreland House		
		Cobb Plantation	Cockrell-Steele House		
		Eatman House	Glover House (HABS)		
		Gordon-Dew-Bamgarger House	Grassdale Plantation House		
		Hutton-Owens	Johnston-Drennon House		
		Jones House	Jolly-Poynor House		
		Lewis Home	Masonic Temple		
		McMillan House	Pippen House		
		St. Johns' in-the-Pines Episcopal Church	Morrow's Store		
		Cedar Mount	Walton House		
		Stage Coach Inn	Thornhill		

Source: Adapted from Alabama Historical Commission Data and County Appraisals of Potentials for Outdoor Recreational Developments.

1/ (NR) - National Register of Historic Places.
(HABS) - Historic American Building Survey.

Table 5.5. Scenic, historic, archaeological and ecological areas, Mississippi portion, Tombigbee River Basin, 1974

County	Natural and scenic	Historic 1/		Archaeological	Ecological Communities
Prentiss	Bluehill Mountain			Pharr Flat Indian Mounds	
	Lebanon Mountain			14 sites	
	Scenic Drive - portions of Highway 4				
	Marietta Mineral Springs				
	Mackeys Creek Rock Outcrop				
Tishomingo	Bay Springs	Greshams Mill			
		Old Mackeys Creek Church Cemetery		7 sites	
Itawamba	Bull Mountain Area	Burrough Cave		49 sites	
	East Fork Tombigbee River				
Lee	James Taylor Farm	Mary Stuart House	Brices Crossroads National Battlefield Site (NR)	68 sites	
	G. H. Burns Farm	John R. Rankin House			
		Scott Farm	Tupelo National Battlefield (NR)		
		Baldwyn Log House			
		Battle of Ackia			
Pontotoc		Lochinvar Home		24 sites	
		Monroe Mission			
		Treaty of Pontotoc (NR)			
Chickasaw		R. W. Chandler House		Owl Creek Site (NR)	
		Confederate Cemetery		15 sites	
		Judge William S. Bates House			
Monroe	Buttahatchie River	Gen. B. M. Bradford House (HABS)		Mound Cemetery Site (NR)	
	Sipsey Creek	Lauri Mundi	Ruben Davis House (HABS)	Hester-Standifer Creek Site (NR)	
	Virgin Stand of Pine Timber	Barrett House	Odd Fellows Rest Cemetery	Lawson Site (NR)	
	Greenwood Springs	Adams-French House (HABS)	Olde Cemetery	Inzer Site (NR)	
	Tombigbee River	The Castle (HABS)	Gardenia Place	67 sites	
		Holliday Haven (HABS)	John Gregg House		
		The Magnolias	Mann House		
		The Oaks	Bell Mission		
		Cotton Gin Port (NR)	Old Athens Jail		
Clay	Kilgore Hill Area	Crump House	Terrell House	25 sites	
	Tombigbee River	Elmview	Waverly (HABS, NR)		
		Martin Rose House	Palo Alto Cemetery		
		Talliaferro House			
Oktibbeha	Noxubee River and Swamp	Stone, John M., Cotton Mill (NR)	Outlaw House	24 sites	
		Montgomery Hall (NR)	The Cedars		
		Montgomery House	Old Gillespie House		
		Rice House	Textile Building (NR)		
Lowndes	Leigh Crest House and Gardens	Stephen D. Lee House (HABS, NR)			
	Tombigbee River and Woodlands	Themerlaine (HABS)	Twelve Gables (HABS)	33 sites	"Chitlin Corners"
		Temple Heights (HABS)	Fairleigh		
		Belmont (HABS)	Franklin Square (HABS)		
		Calloway Hall	Homewood (HABS)		
		Amzi Love House (HABS)	Pratt-Thomas House (HABS)		
		Camellia Place (HABS)	Riverview (HABS)		
		The Cedars (HABS)	Rosedale (HABS)		
		Colonnade	Sanders House (HABS)		
		Enolton (HABS)	Whitehall (HABS)		
		St. Paul's Rectory	Snowdown (HABS)		
		White Arches (HABS)	Shadowlawn (HABS)		
Noxubee	Noxubee River and Swamp				
	Bluff Lake	Dancing Rabbit Creek Treaty Site (NR)		32 sites	
		Cline House (HABS)	Thompson House		
		Harrison House (HABS)	Yates House (HABS)		
		J. J. Pleasants House (HABS)	McLeod Home		
		Richardson House (HABS)	Morgan House		
		Scales House (HABS)	Jackson Military Road		
Kemper	Thomas Pond and Watermill	Giles Plantation		2 sites	
	Sandpit and Domes	Jackson Military Road			
	Ciples Watermill	Electric Mills			
Lauderdale	Ponta Creek	Lauderdale Springs CSA Cemetery		1 site	
	Miller Swamp	Marion CSA Cemetery			
		Sam Dale State Park			
Winston	Vernons Mill Development	Old Robinson Road		2 sites	

Source: Mississippi Statewide Comprehensive Historic Preservation Plan, Mississippi Department of Archives and History, Second Edition, Volume II, 1974.
An Appraisal of Potential Outdoor Recreation Developments in Northeast Mississippi, U.S Department of Agriculture, Soil Conservation Service, 1968.

1/ (NR) - National Register of Historic Places.
(HABS) - Historic American Building Survey.

Water

Surface Water Quantity - Overall, the basin-wide average annual rainfall is 53 inches--about 39 million acre-feet per year. A large part is returned to the hydrologic cycle by evapo-transpiration, a small part infiltrates into the ground water reservoirs, and the remainder becomes streamflow--19 to 20 inches.

The majority of the streamflow originates in the tributary streams in the Tombigbee headwater area. Major tributaries are Town Creek, Bull Mountain Creek, Buttahatchee River, Tibbee Creek, Luxapalila Creek, Lubbub Creek, Coal Fire Creek, Sipsey River, Noxubee River, Sucarnoochee River, and Chickasaw Bogue. One of the largest major tributaries, the Black Warrior River, is excluded from the basin. There are many minor streams that empty directly into the Tombigbee River.

The maximum, minimum, and average yearly runoff in inches, among other data, are listed in table 5.6 for selected gaging stations (see map 5.4 for gage locations). Large reservoirs, locks, and dams influence all gages along the Tombigbee River at and below Demopolis, Alabama. The future Tennessee-Tombigbee Waterway will influence gages along the Tombigbee River above Demopolis, Alabama.

Withdrawals from surface water sources are a very small percentage of the total flow of the principal streams. Surface water supplies municipal withdrawals for Columbus, Mississippi and Haleyville, Quin, Fayette, Livingston, Winfield, York, and Jackson, Alabama. Surface water also supplies the needs of the American Can Company plant at Bellamy, Alabama, and for the power generation cooling supply in Greene County, Alabama.

The upland streams are an important part of the surface water resource. These streams provide, among other things, a disposal system for runoff water, areas of scenic beauty, sites for recreation and fishing, and provide water for wildlife and domestic animal utilization. Selected stream data are presented in table 5.7.

Surface Water Quality - The quality of water in the streams is generally good. The Tombigbee River, particularly in the lower portion, has a brownish hue imparted to the water from the soil and decomposing vegetation in the drainage basin. Turbidity is common after rains but the muddy appearance usually declines after a few days. Sand and gravel operations along the river cause some turbidity problems.

Nitrogen and phosphorus levels of the Tombigbee River are well within limits typical of an unpolluted stream. Generally, the bacterial counts are low and the river contains low concentrations of chemicals. The dissolved oxygen content of the river is normally 70 percent of the saturation value.

Table 5.6. Maximum, minimum and average runoff rates at selected gaging stations, Tombigbee River Basin, selected years.

Gaging station	Drainage area	Watershed			Square mile		
		Average	Maximum	Minimum	Average	Maximum	Minimum
	Sq. mi.	Inches	Inches	Inches	Acre-feet	Acre-feet	Acre-feet
Tombigbee River near Fulton, Miss.	605	19.65	34.90	8.44	1,048	1,861	450
Tombigbee River near Amory, Miss.	1,941	20.54	35.98	8.82	1,095	1,919	470
Tombigbee River at Columbus, Miss.	4,490	18.87	34.08	7.77	1,006	1,817	414
Tombigbee River near Cockrane, Ala.	5,990	18.90	32.20	8.04	1,008	1,717	429
Tombigbee River at Demopolis, Ala.	15,400	19.37	33.44	9.88	1,033	1,783	527
Mackeys Creek near Dennis, Miss.	66	20.69	31.49	9.56	1,103	1,679	510
Bull Mountain Creek near Smithville, Miss.	335	21.69	40.85	10.89	1,157	2,179	581
Old Town Creek near Tupelo, Miss.	112	23.67	40.44	8.13	1,262	2,157	434
Buttahatchee River below Hamilton, Ala.	284	23.93	44.00	12.43	1,276	2,346	663
Chuquantonchee Creek near West Point, Miss.	514	19.63	36.21	6.58	1,048	1,931	351
Tibbee Creek near Tibbee, Miss.	928	18.42	36.08	5.18	982	1,924	276
Luxapilila Creek near Fayette, Ala.	127	21.96	36.19	11.59	1,171	1,930	618
Luxapilila Creek at Steens, Miss.	309	21.22	38.77	11.02	1,132	2,067	588
Coal Fire Creek near Pickensville, Ala.	131	16.43	22.81	9.41	876	1,216	502
Sipsey River near Elrod, Ala.	518	19.71	33.93	10.21	1,051	1,809	544
Noxubee River at Macon, Miss.	812	16.04	32.15	4.14	855	1,715	221
Noxubee River near Geiger, Ala.	1,140	16.34	36.31	3.90	871	1,936	208
Sucarnoochee River at Livingston, Ala.	606	16.32	32.56	8.10	870	1,736	432
Tuckobum Creek near Butler, Ala.	112	14.48	29.03	4.95	772	1,548	264
Okatuppa Creek at Gilbertown, Ala.	151	16.83	26.44	6.32	898	1,410	337
Satilpa Creek near Coffeeville, Ala.	166	16.07	32.36	6.41	857	1,726	342
East Bassett Creek at Walker Springs, Ala.	188	18.90	31.88	10.17	1,008	1,700	542

Source: Water Resources Data, Alabama and Mississippi, United States Geological Survey.

GAGE	STATION
4300	Mackeys Creek near Dennis, MS
4310	Tombigbee River at Fulton, MS
4330	Bull Mt. Creek near Smithville, MS
4340	Old Town Creek near Tupelo, MS
4370	Tombigbee River near Amory, MS
4380	Buttahatchee River near Hamilton, AL
4405	Chuquatonchee Creek near West Point, MS
4410	Tibbee Creek near Tibbee, MS
4415	Tombigbee River at Columbus, MS
4420	Luxapalila Creek near Fayette, AL
4430	Luxapalila Creek at Steens, MS
4440	Coal Fire Creek near Pickensville, AL
4445	Tombigbee River near Cockrane, AL
4465	Sipsey River near Elrod, AL
4480	Noxubee River at Macon, MS
4485	Noxubee River near Geiger, AL
4670	Tombigbee River at Demopolis, AL
4675	Sucarnoochee River at Livingston, AL
4695	Tuckabum Creek near Butler, AL
4697	Okatuppa Creek at Gilbertown, AL
4698	Satilpa Creek near Coffeeville, AL
4701	East Bassett Creek at Walker Springs, AL

LEGEND

- Roads
- (17) State Highway Numbers
- (43) Federal Highway Numbers
- Railroads
- Study Area Boundary
- Sub-Basin Boundary
- 34 Sub-Basin Number
- County Line
- State Line

Source: Geological Survey, United States Department of the Interior.

Map 5.4

SELECTED GAGING STATIONS

TOMBIGBEE RIVER BASIN
MISSISSIPPI-ALABAMA

SCALE IN MILES

LOCATION MAP

August, 1976

Table 5.7. Stream lengths of the upstream area by drainage area groups, Tombigbee River Basin, 1970

Sub-basin number and name	Stream lengths				
	Sub-basin total	Drainage area groups - sq. miles			
		1 - 5	5 - 20	20 - 100	100 - 400
	Miles	Miles	Miles	Miles	Miles
34a - Old East Fork Tombigbee River	1,974.9	1,545.9	209.9	155.0	64.1
34b - Old West Fork Tombigbee River	1,054.8	816.8	142.1	68.9	27.0
34c - Buttahatchee River	1,325.0	1,057.4	143.2	66.1	58.3
34d - Tibbee River	1,688.4	1,348.5	210.3	75.2	54.4
34e - Sipsey River	1,145.1	933.0	110.9	45.0	56.2
34f - Noxubee River	2,242.4	1,628.9	356.9	196.3	60.3
34h - Sucarnoochee River	1,588.6	1,281.8	167.2	91.3	48.3
34U - Upper Tombigbee River	3,912.3	3,045.4	487.4	249.8	129.7
34L - Lower Tombigbee River	6,559.1	5,273.4	635.3	481.8	168.6
Basin	21,490.6	16,931.1	2,463.2	1,429.4	666.9

Source: Soil Conservation Service, United States Department of Agriculture.

Pollution problems in localized areas cause degradation of the quality of water in the river and tributary streams. These isolated areas of depressed dissolved oxygen concentrations occur downstream of the cities of Amory and Columbus, Mississippi, among others. The Noxubee River below Macon, Mississippi, is a tributary that exhibits the worst conditions. Contact the Alabama Water Improvement Commission or the Mississippi Air and Water Pollution Control Commission for specific data on water quality.

Ground Water Quantity and Quality - The existing aquifers are the Ripley Formation, Coffee Sand Formation, Eutaw Formation, McShan Formation, Gordo Formation, Coker Formation, and Lower Cretaceous series.

The Ripley Formation is not a major aquifer and generally yields small quantities of water to shallow dug and bored wells. The quality of this water is poor when compared to water from deeper formations. Generally, this formation crops out in the Pontotoc Ridge area and is used as a source of water for farm use.

Water supply from the Coffee Sand is used for domestic water in the extreme northern portion of the basin. These sands vary from slightly more than 200 feet thick to less than 100 feet, with a permeability probably as high as 100 gallons per day (gpd) per square foot in beds of coarse sand, tapering downward as the beds become thinner and the sands finer. The quality of water from this formation is generally good.

The Eutaw Formation ranges from 250 to 300 feet thick in the northern portion of the basin to some 150 to 200 feet in the southern portion. This formation furnishes water for rural and public water supplies as well as being the major supplier of water for industrial use. Wells yielding more than 500 gallons per minute (gpm) have been developed throughout the basin. Quality of this water is generally good, containing small amounts of dissolved solids, and is soft to moderately hard. However, in the Kemper-Lauderdale Counties area, quality decreases and water from this formation would not be used if water of a better quality could be economically obtained.

The McShan Formation sand beds are variable in thickness and in grain size. Water generally contains only a fraction as much dissolved solids as that in the overlying Eutaw, but slightly more than the underlying Gordo Formation. In the valleys, the McShan Formation is the source for many flowing stock water wells. It is also tapped for many domestic and farm supply wells but is seldom used as a source for municipal or industrial supplies.

The Gordo Formation is some 300 feet thick in places, thinning out to only 20 to 40 feet in the extreme northern portion of the basin. This formation plays a minor part in water uses in the northern portion of the basin, but increases in importance of use further south, with yields of 500 gpm or more where normal thickness of sand and gravel is

present. Quality is generally good and the water is relatively soft. It is low in dissolved solids and chlorides. However, iron content is high and would require treatment for some uses. Water from this aquifer is generally used for industrial supply and livestock supply rather than for domestic and municipal use.

The Coker Formation is divided into two parts. The lower part consists of coarse sand quartz, quartz, and chert gravel with small amounts of clay and shale. The upper part is mostly clay but thick beds of coarse sand occur in places. This formation is relatively thin in northern Monroe County but increases in thickness up to some 600 feet further south. Water quality is similar to that of the Gordo Formation but contains less dissolved solids. This formation, from a water supply standpoint, is the best aquifer in the area; however, this source of water is not well developed. The estimated potential yield is greater than 100 mgd.

The only source of ground water in the southwest corner of the basin is the Naheola Formation or the Wilcox Group. The steep dip of the cretaceous aquifers, combined with the thickness of non-waterbearing formations above, make water wells in the cretaceous aquifer uneconomical.

Potential Impoundments - Physical potential for upstream reservoirs is good. Every sub-basin possesses suitable topography and soil conditions for storage of large quantities of water. Generally, average costs can be assumed for installation.

Land resource area divisions are of primary concern in location of impoundment sites. Much of the land in LRA 135 is on gentle relief. Wider bottoms and higher sediment yields contribute to higher construction costs in this LRA.

Potential impoundments offer excellent opportunity for recreational, fish and wildlife, irrigation, and water quality control uses. Municipal and industrial use is possible.

In addition to upstream reservoirs, there is excellent potential for many on-farm impoundments. They could be used for flood prevention, livestock water, fish farming, recreation, and fish and wildlife.

Fish and Wildlife

Present hunting and fishing supplies are the product of man's activities and natural habitat conditions. Man's influence is by acts of commission such as clearing land, restocking game and fish, planting trees, building ponds and burning woodlands, and by acts of omission such as abandoning cropland, allowing ditch banks and field borders to grow into brushy areas, and allowing beavers to develop wetlands. The

composite of such actions unite to form the total habitat and environment for fish and wildlife. This may vary some from year to year and place to place but, as a whole, is fairly stable.

Fishing is an important use of basin waters. Because of soil fertility and climate, nearly all basin waters are fertile enough to produce many more pounds of fish than are presently being harvested. Bluegill bream, shellcracker, bass, catfish, and crappie are local names for the more common game fish species sought by basin residents. Although man-made impoundments produce most of the catch each year, there are thousands of miles of streams and rivers with fishery resources that are valuable. Noxubee and Tombigbee Rivers are two more commonly fished major streams. Many smaller streams are locally important for fishing.

Wildlife is abundant throughout the basin. Deer and turkey are present in all counties in Mississippi and Alabama. The southern portions of the basin have particularly high deer and turkey populations. Some areas in the Blackland Prairie also have high deer populations, even though suitable habitat is in short supply. Turkey require fairly extensive tracts of mature hardwoods to provide food and cover. Only those areas with extensive hardwoods have high turkey populations. Bottomland hardwoods provide the best habitat for deer, squirrel, and turkey. Upland hardwoods provide the second best habitat and pine forest provide the least productive habitat.

Quail, dove, and rabbit are farm game animals that occur in numbers relating to cover conditions, cropping patterns, and crops grown. The prairie region generally has high dove populations and good quail and rabbit populations where sufficient cover exists.

Waterfowl populations are highest along the major streams and rivers and their associated wetlands. Noxubee Wildlife Refuge attracts and holds thousands of ducks each fall and winter. Ducks also use nearby wetlands along Noxubee River and flooded soybean fields for feeding areas. Many species of migratory waterfowl pass through the basin. Most common are the mallard, wood duck, gadwall, scaup, and ring-necked duck.

Fur-bearing animals are abundant. Many persons supplement their income by trapping mink, muskrat, beaver, and fox during the winter. The most productive fur-animal habitat is along streams, rivers, and wetlands associated with bottomland hardwoods.

During recent years there has been much activity in classifying and describing rare and endangered species. Subsequent to federal and state mandates, committees have been formed to list such species within their state boundaries. For most states this has been a first-time effort with a considerable lack of knowledge as to what is rare and endangered. Such is the case in the basin. Mississippi and Alabama have initiated efforts to identify and list rare and endangered species. Important wildlife species that would possibly be affected by projects of the nature and scope described within this document are listed in table 5.8.

Table 5.8. Rare and endangered species, Tombigbee River Basin, 1975

Species	Status 1/	Species	Status 1/
Fishes		**Reptiles**	
Scaphirhynchus sp. Sturgeon sp.	Endangered	Pituophis melanoleucus lodingi Black Pine Snake	Endangered
Percina lenticula Freckled Darter	Rare	Lampropeltis calligaster rhombomaculata Mole Snake	Rare
Stizostedion vitreum Walleye	Peripheral - Undetermined	Micrurus fulvius fulvius Eastern Coral Snake	Rare
Ichthyomyzon castaneus Chestnus Lamprey	Undetermined	**Birds**	
Polyodon spathula Paddlefish	Undetermined	Haliaeetus leucocephalus Bald Eagle	Endangered
		Falco peregrinus Peregrine Falcon	Endangered
Amphibians			
Ambystoma tigrinum tigrinum Eastern Tiger Salamander	Rare	Dendrocopos borealis Red-cockaded Woodpecker	Endangered
Rana arealota sevosa Dusky Gopher Frog	Rare	Vermivora bachmani Bachman's Warbler	Endangered
Reptiles		Elanoides forficatus Swallow-tailed Kite	Rare
Macroclemys temmincki Alligator Snapping Turtle	Rare		
		Mammals	
Gopherus polyphemus Gopher Tortoise	Rare	Canis latrans Coyote	Rare
Alligator mississippiensis American Alligator	Endangered	Ursus americanus Black Bear	Threatened
Eumeces anthracinus pluvialis Southern Coal Skink	Threatened in Mississippi	Felis concolor Cougar	Endangered
Farancia erytrogramma Rainbow Snake	Endangered		

Source: A Preliminary List of Rare and Threatened Vertebrates in Mississippi, Rare and Endangered Species Committee, Rare and Endangered Vertebrates of Alabama, Alabama Department of Conservation and Natural Resources.

1/ Endangered - A species which is in danger of extinction throughout all or a significant portion of its range. Threatened - A species which may become an endangered species within the foreseeable future in all, or a significant portion, of its range. Rare - A rare species is one that, although not presently threatened with extinction, is in such small numbers throughout its range that it may be threatened or endangered if its environment worsens. Undetermined - A species of undetermined status is one that has been suggested as possibly threatened or endangered, but about which there is not enough information to determine its specific status. Peripheral - A peripheral species or subspecies is one whose occurrence in an area is at the edge of its natural range and which is rare, endangered or undetermined in that area, although not necessarily in its range as a whole.

Recreation

Parts of the water and related land resources of the basin are presently being used for recreation purposes. Facilities for the various recreation activities are located throughout the basin. Among these activities are swimming, picnicking, water skiing, boating, hiking, camping, hunting, and fishing. Overall, the resources of the basin provide for the present demands for water skiing, boating, hiking, hunting, and fishing. There are needs for more swimming pools and swimming beaches as well as picnicking and camping facilities. At some locations, facilities for water skiing may not be adequate.

Acreage of land and water used for selected recreation pursuits is shown in table 5.9. The recreation resource base is inadequate for swimming, picnicking, and camping. Hunting and fishing resources are discussed elsewhere.

Existing Programs

Corps of Engineers

Existing and authorized projects include the Black Warrior-Tombigbee Waterway, the Tennessee-Tombigbee Waterway, and the 22 tributary projects of the Tombigbee River. The Black Warrior-Tombigbee Waterway is partly in the basin. The other projects are entirely in the basin.

The Black Warrior-Tombigbee Waterway, located in Alabama, provides essentially for a channel 9 feet deep, 200 feet wide, and 453 miles long to serve the heavy barge traffic between the port of Mobile and the Birmingham industrial area (see map 5.5). The total lift of 258 feet is accomplished by six locks and dams.

The original construction program, consisting of 17 dams and 18 lifts, was completed in 1915. In a modernization program begun in 1937, 16 of the original small, low-lift structures have been replaced by five large, high-lift structures. These five locks and dams are Coffeeville, Demopolis, Warrior, William Bacon Oliver, and Holt. The locks at John Hollis Bankhead Dam, the uppermost structure, have been replaced by a modern high-lift lock that was opened in 1975. The Coffeeville and Demopolis locks and dams are located on the Tombigbee River.

The Black Warrior-Tombigbee Waterway project was authorized by various rivers and harbors acts during the period 1884-1960. Replacement of the obsolete structures was authorized by the 1909 Rivers and Harbors Act. Construction costs to June 30, 1974, exclusive of $607 thousand spent on previous projects, amount to $137 million. Commercial traffic on the waterway has increased from less than two million tons in 1937 to more than 14 million tons in 1973.

Table 5.9. Present land and water supply for specified recreation activities, Tombigbee River Basin, 1970

Activity	Mississippi portion					Alabama portion				
	Planning and Development District				State	Planning and Development District			State	Basin
	2	5	6	8	Total	1	2	6	Total	Total
Swimming										
Water acres	0.4	8.7	2.6	1.7	13.4	0.4	2.9	1.1	4.4	17.8
Land acres	0.1	32.9	2.5	7.7	43.2	0.0	11.7	0.0	11.7	54.9
Picnicking										
Land acres	8.0	54.0	50.0	14.0	126.0	10.0	2.0	25.0	37.0	163.0
Waterskiing										
Water acres	0.0	761.0	389.0	1,417.0	2,567.0	187.0	1,262.0	2,109.0	3,558.0	6,125.0
Boating										
Water acres	260.0	6,844.0	7,950.0	1,053.0	16,107.0	1,452.0	6,297.0	21,756.0	29,505.0	45,612.0
Hiking										
Land acres	13.0	450.0	925.0	83.0	1,471.0	1,060.0	25.0	9,002.5	10,087.5	11,558.5
Camping										
Land acres	3.0	7.0	185.0	3.0	198.0	0.2	17.0	10.0	27.2	225.2

Source: Developed using space standards in the Alabama and Mississippi Statewide Comprehensive Outdoor Recreation Plans.

The Coffeeville Lock and Dam Wildlife Refuge, authorized in 1960, will include 4,250 acres within the reservoir area and along its boundaries.

The Tennessee-Tombigbee Waterway, authorized by Congress in the Rivers and Harbors Act of 1946, provides for a navigable connection between the Tennessee and Tombigbee Rivers. The project, with an overall 253 miles of channel length, consists of three sections--the river section, the canal section, and the divide section.

The actual project, as depicted on map 5.5, extends from Demopolis, Alabama upstream via the Tombigbee River, the East Fork of the Tombigbee, Mackeys Creek, a deep cut through the divide into Yellow Creek and thence via Yellow Creek to the Pickwick Pool in the Tennessee River. The overall lift, provided by 10 locks, between Demopolis and the Pickwick Pool is 341 feet.

The river section extends 168 miles upstream from Demopolis to a point just south of Amory, Mississippi. The plan for this section includes four locks and dams and channel development. This river section, 9 feet deep and 300 feet wide, lifts the waterway 117 feet. The locks for this section as well as for the other sections have inside dimensions of 110 feet by 600 feet. Construction began on the Gainesville Lock and Dam in 1972. As of October 1975, contracts for the Aliceville and the Columbus Locks and Dams have been awarded.

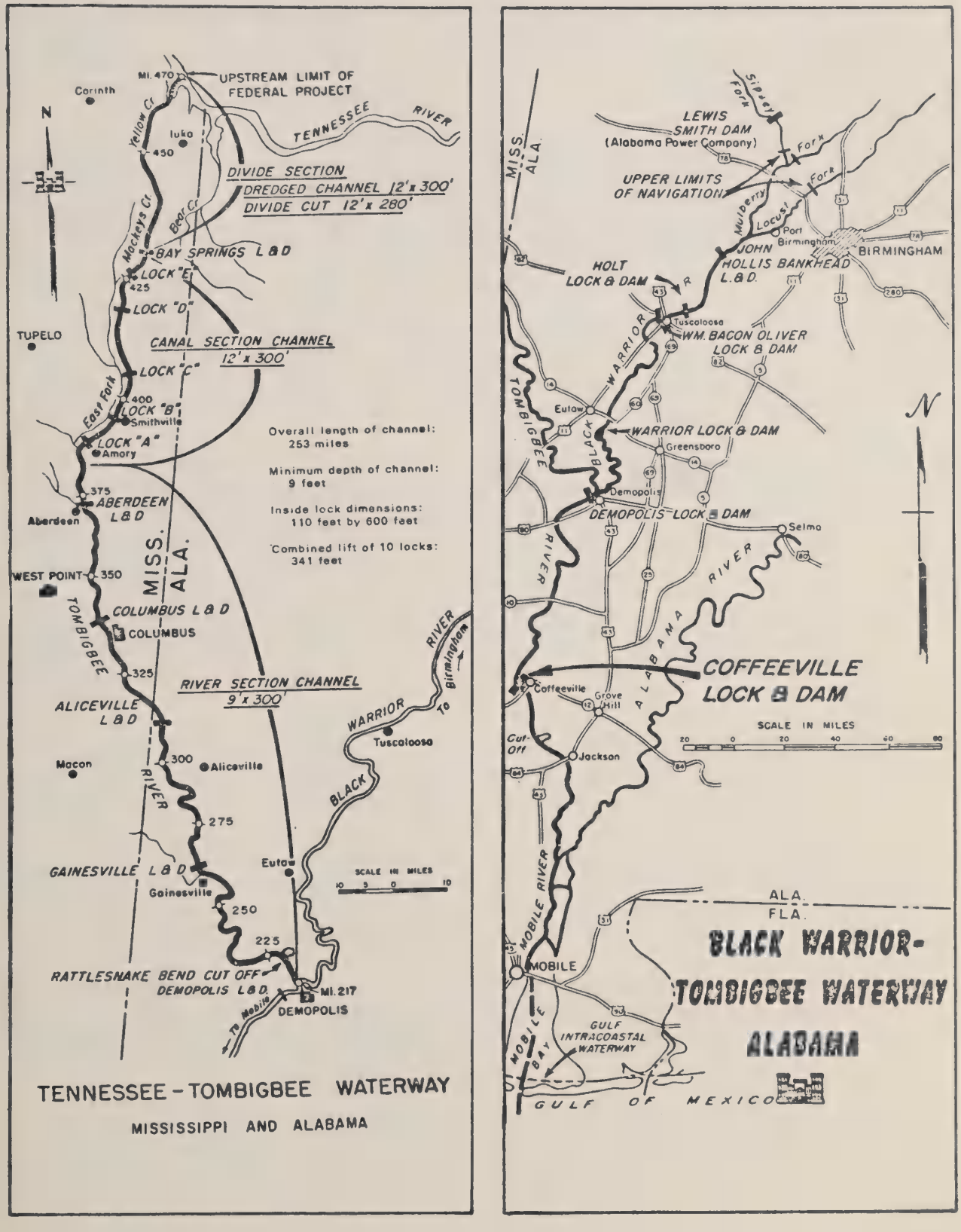
The canal section extends 45 miles upstream from the river section and includes five locks. These locks provide a total waterway lift of 140 feet. The canal will roughly parallel the East Fork of the Tombigbee River along the eastern part of the floodplain and will be separated from the river by a levee or dike. The channel size in this section will be 12 feet deep and 300 feet wide. As of October 1975, construction on this section had not started.

The divide section is 40 miles long and consists of the Bay Springs Lock and Dam that provides a lift of 81 feet and a deep cut through the divide and channel that follows Yellow Creek to Pickwick Reservoir. The divide cut section is 12 feet deep and 280 feet wide. The dredged Yellow Creek channel is 12 feet deep and 300 feet wide. Some work has begun on the divide section in Tishomingo County, Mississippi, with groundbreaking ceremonies held on July 8, 1974.

The river and canal sections of the waterway are being designed and constructed by the Mobile District of the Corps of Engineers and the divide section by the Nashville District. Completion of the waterway, dependent on Congressional appropriations, is scheduled in the early 1980's. The overall cost of the project, based on July 1973 price levels, is estimated at $703 million, including $80 million to local interests for relocating roads and highways.1/

1/ These estimates are subject to revision.

Map 5.5. Present and proposed waterways, Tombigbee River Basin



Local sponsors are the Tombigbee River Valley Management District for Mississippi and the Tombigbee Valley Development Authority for Alabama, both official state agencies. The Tennessee-Tombigbee Waterway Development Authority, created through a Congressionally ratified compact between the States of Alabama, Florida, Kentucky, Mississippi, and Tennessee, is an active advocate for construction of the waterway. Also, it serves as overall coordinator for planning by state and local governments relating to the waterway.

The Tombigbee River and Tributaries, Mississippi and Alabama projects, authorized in the Flood Control Act approved July 3, 1958 (Public Law 85-500), provide for flood reduction measures for 22 streams tributary to the Tombigbee River in Northeast Mississippi and Northwest Alabama (see map 5.6). Project measures to reduce flood damages include channel clearing, snagging, enlargement, and realignment.

Plan implementation for the stream segments of the authorized projects is in various levels of development. Some segments are installed. Others are in the process of being installed, being restudied, scheduled for restudy, and being recommended for de-authorization.

Local interests establish the priorities for the various stream segments. The Tombigbee River Valley Water Management District has been designated to act as project sponsor in Mississippi, and the Tombigbee Valley Development Authority is the sponsor for those parts of the tributary project in Alabama.

Installation is complete for six of the project tributaries--Big Browns Creek, Donivan Creek, Twenty Mile Creek, Mantachie Creek, Stanifer Creek, and James Creek. Luxapalila Creek project is partly installed.

Big Browns Creek project consists of channel work from its mouth to mile 4.4. The work was completed and the project was turned over to local interests in December 1965.

Donivan Creek project consists of channel work from its mouth to mile 4.2. Work was completed and the project turned over to the local interests for maintenance in April 1966. Additional work in a transition section near the mouth was completed in 1970.

The Twenty Mile Creek project included channel work from its mouth to mile 11.7. Local interests received the project and assumed maintenance responsibilities in December 1966. A transition channel section near the mouth was installed in 1970.

Mantachie Creek project was completed and turned over to the local interests for maintenance in November 1967. The project consists of channel work from its mouth to mile 5.0.

Stanifer Creek project included channel work from its mouth to mile 3.6 and also included special project features to protect the habitat of an oxbow lake to mitigate fish and wildlife losses. The project was turned over to local interests for maintenance in December 1971.

James Creek work consisted of channel clearing and clearing and snagging from the mouth to mile 9.0. The work was completed in 1968.

The Luxapalila Creek segment of the project would consist of excavation and clearing of banks along 19.9 miles of channel in Lowndes County, Mississippi and Lamar County, Alabama to reduce flood damages in the floodplain that includes some urban damages in Columbus, Mississippi. The lower 2.1 miles of the project were completed and turned over to local interests on November 15, 1973. Work on the remaining 17.8 miles of channel work has not been initiated.

The Buttahatchee River project segment is being restudied. There has been considerable interest in the project by all involved interests. The restudy will re-evaluate the present and future flood control needs of the area and examine alternative plans in the complete reformulation of the project.

A restudy, within the Tibbee River Basin, is underway on the streams authorized for flood damage reduction projects. The restudy is being processed concurrently with the Buttahatchee study and will involve project reformulation of the authorized work for the main river and for nine tributary streams.

Town Creek segment (West Fork) and East Fork along with Yellow Creek have been restudied and feasible projects were not formulated. These projects are considered inactive.

Under Section 12 of PL-93-251, the de-authorization of the Noxubee River project has been recommended by the Corps of Engineers. This de-authorization also has been recommended for the Sipsey River project.

In addition to the 22 tributary projects, a levee study in the vicinity of Columbus is being made. Engineering and hydraulic studies to determine the feasibility of reducing flood damages in this urban area are now in progress.

Soil Conservation Service

The Soil Conservation Service as a technical agency of the U. S. Department of Agriculture is charged with the responsibility of developing and carrying out a national soil and water conservation program. The Service provides technical assistance primarily through Soil and Water Conservation Districts and River Basin Water Management Districts to

LEGEND

- COMPLETED
- IN ADVANCED PLANNING STAGE
- ADVANCED PLANNING NOT INITIATED
- AUTHORIZED [redacted] TENNESSEE-TOMBIGBEE [redacted]TERWAY
- AUTHORIZED ALLIGNMENT OF CANAL SECTION OF TENNESSEE - TOMBIGBEE WATERWAY

[1] PROJECT RECOMMENDED FOR DE-AUTHORIZATION
[2] PROJECT PRESENTLY [redacted] RESTUDIED

Map 5.6

U. S. ARMY ENGINEER DISTRICT, MOBILE
CORPS OF ENGINEERS
MOBILE, ALA.

FLOOD CONTROL ON TOMBIGBEE RIVER AND TRIBUTARIES
MISSISSIPPI AND ALABAMA

WATERSHED MAP

help individuals, groups, and units of government to develop and carry out soil and water conservation plans.

[Soil Conservation Service Establishing Act (Public Law 46)]

In April 1935, the Congress of the United States passed the Soil Conservation Service Establishing Act (PL-46). This Act provided means for the Secretary of Agriculture, through the Soil Conservation Service, to work with individual landowners in soil conservation districts in protecting land resources against soil erosion and for other purposes. The first districts were organized in 1939. Since that time all counties in the basin have been organized into soil and water conservation districts and are actively engaged in carrying out soil and water conservation programs with landowners.

Continuing field mapping to prepare detailed soil surveys is in progress throughout the basin. Soil Conservation Service technicians assist land users in preparing, revising, and updating conservation plans on individual farms in each county within the basin. Land treatment measures for watershed protection applied to date include such practices, among others, as conservation cropping systems, pasture planting and management, farm ponds, drainage, terraces, contour farming, critical area plantings, tree planting, and forest management. These land treatment measures were applied on the land through PL-46 and other on-going programs.

[Watershed Protection and Flood Prevention Act (Public Law 566)]

The Watershed Protection and Flood Prevention Act (PL-566) authorizes the Secretary of Agriculture to cooperate with state and local agencies in planning and implementing water and related land programs and projects. A number of requests for assistance in watershed planning and implementation in the Tombigbee River Basin under PL-566 have been received and acted upon by the Soil Conservation Service. Map 5.7 shows the locations and the status of the various PL-566 watersheds within the basin. Six watersheds that are either completed and are presently under operation and maintenance agreements with local sponsors, or are in operation status with the structural program started but not yet completed are as follows:

Chiwapa Creek Watershed, Mississippi - This 101.3 thousand acre PL-566 watershed, located in Pontotoc, Lee, and Monroe Counties, was authorized April 8, 1960, to alleviate the principal problems of floodwater and sediment damages to agricultural lands. About 70 percent of the land treatment measures have been installed. Overall, 30.6 thousand acres of land are adequately treated.

Major installed structural measures include nine floodwater retarding structures (FWRS), one multi-purpose structure, and 71.1 miles of channel improvement. This represents 100 percent of the planned structural measures. The project will benefit 13.3 thousand acres of floodplain lands. Average annual benefits are $274.8 thousand.

Chuquantonchee Creek Watershed, Mississippi - Authorized October 11, 1963, this PL-566 watershed is comprised of 136.8 thousand acres within Clay, Chickasaw, Pontotoc, and Monroe Counties. The principal problems are flooding, sediment, and erosion damages to agricultural lands. Approximately 45 percent of the planned land treatment measures are installed. Overall, 29.8 thousand acres of land are adequately treated.

Structural measures installed or under contract total 13 floodwater retarding structures. Eight other FWRS's remain to be installed. These project measures will benefit 17.1 thousand acres of floodplain land. Average annual benefits are $196.7 thousand.

Town Creek Watershed, Mississippi - Located in Lee, Pontotoc, Prentiss, and Union Counties, this 247.0 thousand acre PL-566 watershed was authorized March 6, 1964. The principal problems are flooding, sediment, and erosion damages to agricultural lands and the urban area of Tupelo, Mississippi. Presently, 91.0 thousand acres of land in the watershed are adequately treated.

Structural measures completed include 12 floodwater retarding structures and one multi-purpose structure. Two floodwater retarding structures are under construction contracts. Thirteen additional floodwater retarding structures and six more multiple-purpose structures are included in the plan. Also planned are some 180 miles of channel improvement.

Some 1.2 thousand acres of urban floodplain will benefit from the program, and 45.9 thousand acres of agricultural floodplain lands. Average annual benefits are $798.8 thousand.

Shammack Creek Watershed, Mississippi - The principal problems of this 10.6 thousand acre PL-566 watershed are floodwater and sediment damages to agricultural lands. The watershed is located in Kemper County and was authorized in March 1961. There are 1.7 thousand acres of floodplain lands benefited from structural measures that include five floodwater retarding structures and 10.7 miles of channel improvement. All of the planned structural measures have been installed. Planned land treatment measures are approximately 75 percent completed. The average annual benefit is $37.5 thousand.

Powell Creek Watershed, Alabama - This PL-566 watershed is located in Marengo County and was authorized in July 1961. The 42.4 thousand acre watershed has floodwater and sediment damages to agricultural lands as the principal problems. About 80 percent of the planned land treatment measures have been installed. Three of the nine floodwater retarding

LEGEND

- Roads
- (17) (43) State Highway Numbers / Federal Highway Numbers
- Railroads
- Study Area Boundary
- Sub-Basin Boundary
- 34 Sub-Basin Number
- County Line
- State Line
- [7] P. L. 566 Watersheds
- (3) RC&D Projects

STATUS OF WATERSHEDS-1975

- INSTALLATION COMPLETE
- IN OPERATION
- BEING PLANNED (included in early action plan)

RC&D

NUMBER	NAME
(1)	BURKETT CREEK
(2)	KEMPER COUNTY LAKE
(3)	ROUNDHOUSE BRANCH
(4)	TOWN CREEK

P.L. 566

NUMBER	NAME
[1]	BROWNS CREEK
[2]	CHIWAPA CREEK
[3]	CHUQUATONCHEE CREEK
[4]	FACTORY CREEK
[5]	HOULKA CREEK
[6]	LINE CREEK
[7]	LITTLE NEW RIVER
[8]	MANTACHIE, BOGUE FALA, & BOGUE EUCUBA CREEKS
[9]	POWELL CREEK
[10]	SHAMMACK CREEK
[11]	SHUQUALAK CREEK
[12]	TOWN CREEK
[13]	TRIM CANE CREEK

Source: Soil Conservation Service, United States Department of Agriculture

Map 5.7

WATERSHED STATUS OF USDA FLOOD CONTROL PROJECTS

TOMBIGBEE RIVER BASIN
MISSISSIPPI-ALABAMA

SCALE IN MILES

structures have been constructed, but none of the planned 14.5 miles of channel work has been installed. As of May 16, 1972, the project became inactive.

Little New River Watershed, Alabama - This PL-566 watershed is located in Marion and Fayette Counties, and is 32.5 thousand acres in size. The watershed was authorized May 2, 1955, and was completed June 25, 1963. The principal problems were flood and sediment damages to agricultural lands. In addition to the land treatment measures, three floodwater retarding structures were planned and constructed. Of the 1.5 thousand acres of floodplain lands, 1.1 thousand acres are benefited by the structural measures. The average annual benefits total $12.0 thousand.

Five PL-566 watersheds are authorized for operation status, of which three have various land treatment measures accomplished but do not have any structural construction program started. No work has been accomplished in the other two. These follow:

Browns Creek Watershed, Mississippi - Authorized in April 1969, this 94.3 thousand acre PL-566 watershed is located in Prentiss, Itawamba, and Tishomingo Counties. The principal problems are flooding and sediment damages to agricultural lands. Overall, 3.2 thousand acres of land are adequately treated.

No structural measures have been installed. Planned measures include eight floodwater retarding structures and 53.3 miles of channel improvement. Benefited areas total 14.1 thousand acres of floodplain. Average annual benefits total $245.0 thousand.

Houlka Creek Watershed, Mississippi - This PL-566 watershed, 146.8 thousand acres in size, is located in Chickasaw, Clay, and Pontotoc Counties. It was authorized in August 1966. The principal problems are flooding, sediment, and erosion damages to agricultural lands. Overall, 20.4 thousand acres of land are adequately treated.

No structural measures have been installed. Planned measures include: 14 floodwater retarding structures, two multiple-purpose structures, and 65 miles of channel improvements. Flood damage reduction will occur on 25.4 thousand acres. Average annual benefits are $252.1 thousand.

Line Creek Watershed, Mississippi - Line Creek Watershed, located in Clay, Chickasaw, and Webster Counties, was authorized in May 1970 under PL-566. This 127.4 thousand acre watershed has flooding and sediment damages to agricultural lands as principal problems.

No structural measures have been installed. However, planned measures will result in 19.6 thousand acres out of 22.5 thousand acres

of floodplain receiving flood reduction benefits. The measures include 13 floodwater retarding structures, two multiple-purpose structures, and 61.5 miles of channel improvements. The average annual benefits are $353.9 thousand.

Mantachie Creek Watershed, Mississippi - This PL-566 watershed is located in Itawamba, Lee, and Monroe Counties, and is 113.6 thousand acres in size. The principal problems are flooding, sediment, and erosion damages to agricultural lands. Planned land treatment measures include 19.8 thousand acres of land to be adequately treated during the installation period.

Structural measures include 12 floodwater retarding structures and two multiple-purpose structures with associated recreational facilities.

Flood damage will be reduced approximately 71 percent by benefiting some 17.9 thousand acres of floodplain area out of 26.0 thousand acres of total floodplain in the watershed. The average annual benefits are $607.1 thousand.

Shuqualak Creek Watershed, Mississippi - This 21.6 thousand acre PL-566 watershed is located in Noxubee and Kemper Counties. The principal problems are flooding and erosion damages to agricultural lands. Adequate land treatment measures on 6.9 thousand acres (including 150 acres of critical area stabilization) will reduce the erosion problem and the construction of two floodwater retarding structures and 5.2 miles of channel work will reduce the average annual floodwater damages by approximately 70 percent.

Of the 2.8 thousand acres of floodplain, there are 2.5 thousand acres benefited by structural measures resulting in an estimated average annual benefit of $112.2 thousand.

[Resource Conservation and Development Projects]

The Resource Conservation and Development Program (RC&D) was authorized in 1962 by the Food and Agriculture Act (Public Law 87-703). This Act authorizes the United States Department of Agriculture to provide technical and financial help to qualified local groups in conserving and developing their natural resources. The Soil Conservation Service was assigned the responsibility of furnishing technical assistance in the preparation and development of plans of these RC&D projects, as well as furnishing various installation costs and supervising the construction of structural measures.

The areas of two authorized RC&D projects, one in Mississippi and one in Alabama, encompass a large portion of the basin. These projects are locally initiated, sponsored and directed. Each is large enough to enable local leaders to carry out project plans that meet the objectives under the RC&D Program (map 5.7).

Northeast Mississippi RC&D Project - The Northeast Mississippi RC&D Project was authorized in 1968 and expanded in 1973. The project area includes 22 counties in Mississippi; all or parts of 17 are located in the basin. All of Clay, Itawamba, Lee, Lowndes, Monroe, and Noxubee Counties are located in the basin; parts of Chickasaw, Choctaw, Kemper, Lauderdale, Oktibbeha, Pontotoc, Prentiss, Tippah, Tishomingo, Union, Webster, and Winston Counties are located in the basin. The other five project counties are Alcorn, Benton, Calhoun, Lafayette, and Marshall.

Measures have been installed in two RC&D flood prevention projects--Roundhouse Branch in Monroe County and Town Creek in Clay County. These measures consist of 11.0 miles of channel improvement, 1.5 thousand acres of openland land treatment, and five acres of critical area treatment.

Two RC&D flood prevention project measures have been authorized for operations--Burkett Creek in Monroe County and Kemper County Lake in Kemper County. The project measures include: one floodwater retarding structure and one multi-purpose structure for floodwater retardation and recreation, including installation of basic facilities; 2.1 thousand acres of openland land treatment; 800 acres of forestland land treatment; and 77 acres of critical area treatment, including roadside erosion control.

Critical area treatment measures have been authorized for operations in eight project counties in the basin. These measures consist of approximately 625 acres of roadbank stabilization, 200 acres of gullies, 800 acres of critical cropland and 300 acres of critical pasture. Installation on approximately 100 acres is complete. By the year 1990, the remaining critical area measures in the eight project counties are planned for installation. Also, critical area treatment will be planned for installation in the remaining project counties.

Special soil interpretative reports, showing as many as 13 soil limitation factors, are very useful in city planning and zoning. These reports have been prepared on approximately 42.0 thousand acres in the towns of Tupelo, Amory, Verona, Starkville, and Houston. By the year 1990, it is planned that special soil interpretative reports will be completed for the remaining major towns in the basin.

Tombigbee RC&D Project - The Tombigbee Resource Conservation and Development Project was approved for operations in April, 1974. The project area includes eight counties in Alabama. All or parts of seven counties are located in the basin. All of Lamar, Pickens, and Sumter Counties and parts of Fayette, Tuscaloosa, Greene, and Hale Counties are located in the basin. The other project county is Bibb.

As of June 1976, five project measures for critical area treatment are installed or being installed. These measures are on the school grounds of Bibb, Hale, Pickens, and Tuscaloosa Counties and in the Lake L. U. measure plan in Sumter County. Also, the Lake L. U. measure

included a reservoir and basic facilities for recreation. In addition, among other measures soil interpretative reports have been prepared for 15 towns and cities within the project area.

U. S. Forest Service

[National Forest Systems]

The Tombigbee National Forest consists of 43.6 thousand acres of federal lands in Pontotoc, Chickasaw, Choctaw, and Winston Counties, Mississippi. These lands are dedicated to the production of clean water, wildlife, recreation, and timber. Since its inception, intensive forest management has enhanced the environmental quality of the area. Soil erosion has been reduced, fires reduced, timber volumes increased, and the recreation potential enhanced.

The forest has two developed recreation areas containing a total of 43 camping units and 67 picnicking units. Both areas offer boating, fishing, and swimming. Hunting is the primary forest recreation use.

[State and Private Forestry]

Cooperative Forest Management (CFM) Program - This program was authorized under Public Law 81-729 (64 Stat. 73), as amended, to improve the management of small private forests and the operations of loggers and small plants processing primary forest products with special attention to maintaining and improving the quality of the environment.

The program is administered by the U. S. Forest Service through the state forestry agencies who provide on-site technical assistance in such activities as preparing forest management plans for the production of timber, wildlife, water, recreation, forage, and other forest values.

Tree Seedling Production (CM-4) - Assistance is authorized under Section 4 of the Clarke-McNary Act of June 1924, as amended; Public Law 68-270 (43 Stat. 653). Both financial and technical assistance are provided to cooperating states for seed or seedling production to be used in multiple-use forest, windbarrier, and watershed plantings on private and non-federal public lands.

Forest Products Utilization (FPU) - The objective of the Forest Products Utilization Program is to extend the supply of our nation's forest resources and protect and enhance the environment through more efficient utilization of forest products.

Working toward these goals, both Forest Service and State Forest Products Utilization personnel provide technical assistance of a highly

specialized nature to timber harvesters and processors throughout the nation.

General Forestry Assistance (GFA) - This program provides highly specialized forestry services to support state forestry organizations and others in their efforts to enhance rural community development and increase the production of forest products under sound principles of resource management.

Assistance provided under the GFA program includes resource management advice to other federal, state, and local government landholding agencies; large private owners, forestry consultants, and other individuals and groups; loggers and processors; local and state groups; and regional planning and development groups. Intensive training of Forest Service and State Forestry personnel and others is required in highly specialized fields to increase professional competence.

Federal Insurance Administration

The National Flood Insurance Program was authorized August 1, 1969 by the Housing and Urban Development Act of 1968 (Public Law 90-448). This program is administered by the Federal Insurance Administration (FIA), an agency of the United States Department of Housing and Urban Development (HUD).

The program was established to make flood insurance available, eventually, throughout the nation. Communities desiring to participate are required to adopt acceptable floodplain management regulations covering development in flood-prone areas. Communities in the basin currently participating in the program are listed in table 5.10. The communities are divided into two categories, the regular program and the emergency program. Those qualified for the regular program have had detailed flood insurance studies completed. The emergency program includes those communities where special flood hazard areas have been identified, in most cases, but detailed flood insurance studies are not complete.

Farmers Home Administration

The Farmers Home Administration (FmHA) provides financial assistance to the rural sector of the nation. The primary objective of the FmHA is to improve the quality of rural living. Financial assistance includes loans for farm ownership, farm operations, rural housing, community water and waste disposal systems, and farm losses sustained by natural events.

Rural community water and waste disposal systems are closely related to water and related land resource development. As of December 1975, 189 water and/or sewer system loans had been made in the basin.

Table 5.10. Communities or counties participating in National Flood Insurance Program, Tombigbee River Basin, as of July 31, 1975

State and community	Sub-basin	Hazard area identified
Alabama		
Aliceville, City of (Pickens Co.)	34 Upper	4/11/75
Beaverton, City of (Lamar Co.)	34c	9/20/74
Carrollton, Town of (Pickens Co.)	34 Upper	8/23/74
Choctaw, County 1/	34 Lower	-
Detroit, Town of (Lamar Co.)	34c	8/30/74
Fayette, County 1/	34 Upper, 34e	1/10/75
Gordo, Town of (Pickens Co.)	34 Upper	2/14/75
Guin, Town of (Marion Co.)	34c	6/14/74
Hamilton, City of (Marion Co.)	34c	5/31/74
Kennedy, Town of (Lamar Co.)	34 Upper	11/01/74
Linden, City of (Marengo Co.)	34 Lower	6/28/74
Livingston, City of (Sumter Co.)	34h	5/31/74
Marengo County 1/	34 Lower	-
Millport, Town of (Lamar Co.)	34 Upper	6/28/74
Mobile County 1/	34 Lower	1/08/72
Reform, Town of (Pickens Co.)	34 Upper	12/27/74
Sulligent, Town of (Lamar Co.)	34c	5/03/74
Vernon, City of (Lamar Co.)	34 Upper	5/03/74
Winfield, City of (Marion Co.)	34 Upper	5/10/74
York, City of (Sumter Co.)	34h	7/11/75
Mississippi		
Aberdeen, City of (Monroe Co.)	34 Upper	1/23/74
Amory, City of (Monroe Co.)	34 Upper	-
Baldwyn, City of (Lee Co.)	34a	6/07/74
Columbus, City of (Lowndes Co.)	34 Upper	6/07/74
Fulton, City of (Itawamba Co.)	34a	6/16/74
Houston, City of (Chickasaw Co.)	34d	6/28/74
Lauderdale County 1/	34 Lower, 34h	-
Lowndes County 1/	34 Upper, 34d, 34f	-
Macon, City of (Noxubee Co.)	34f	1/31/75
Mantachie, Town of (Itawamba Co.)	34a	6/21/74
Okolona, City of (Chickasaw Co.)	34 Upper, 34b	6/21/74
Plantersville, Village of (Lee Co.)	34b	6/14/74
Saltillo, Town of (Lee Co.)	34b	-
Starkville, City of (Oktibbeha Co.)	34d	6/07/74
Tupelo, City of (Lee Co.)	34b	6/14/74
Verona, Town of (Lee Co.)	34b	6/13/74
West Point, City of (Clay Co.)	34d	6/21/74

Summary	Alabama	Mississippi
Total in the flood program	20	17
Total in the regular program	1	0
Total in the emergency program	19	17
Total in the emergency program with hazard area identified	17	13

Source: Federal Insurance Administration, United States Department of Housing and Urban Development.

1/ Unincorporated area only.

In addition, 18 recreation, eight small watershed, and five community facilities loans had been made for a total of 220 for the basin. These loans were made to defray the local costs to these groups for the various projects.

Agricultural Stabilization and Conservation Service

The Agricultural Stabilization and Conservation Service (ASCS) has the responsibility for providing cost sharing to farmers for implementing soil and water conservation practices that stabilize the land, reduce erosion, control sediment, improve and establish forest lands, manage runoff, abate pollution, and improve the environment. The program was recently modified and updated.

The ASCS also is responsible for improving and stabilizing farm income in order to bring about a better balance between supply and demand of agricultural commodities, and for assisting farmers in marketing their products. Stabilization of farm incomes is achieved by making loans to eligible farmers for producing various agricultural crops. If market prices are good at the time of harvesting, the farmer repays the loan from his profits. If market prices are not good, the farmer repays the loan by forfeiting the crop which serves as collateral for the loan.

U. S. Fish and Wildlife Service

The U. S. Fish and Wildlife Service has several program functions operating within the basin. Tupelo Fish Hatchery produces game fish for stocking in approved basin waters through cooperative programs with the Mississippi Game and Fish Commission and the Soil Conservation Service. Noxubee and Choctaw National Wildlife Refuges are lands owned by the Fish and Wildlife Service that utilize multiple use in providing for protection, propagation, and consumptive and non-consumptive uses of their natural resources.

Ecological studies provide input into federal and state projects affecting basin resources under the Fish and Wildlife Coordination Act. Wildlife personnel provide consultation to landowners on how to prevent damage to crops, livestock, and other resources from wildlife.

Game management agents enforce federal conservation laws for the protection of wildlife resources. Federal aid programs assists state governments in fish and wildlife management programs through systems of federal aid funding. Funds are used for fish restoration, wildlife restoration, and hunter safety programs.

Alabama Development Office

The Alabama Development Office (ADO), one of the sponsors of this study, is the principal executive planning agency for Alabama's human, economic, and physical resources. Six divisions make up the Office, with the State Planning Division designated to do resource planning dealing with natural resources. Also, among other tasks, this division coordinates planning with regional offices, provides planning assistance to regional and community programs, maintains an information service library, serves as a state clearinghouse, and receives initial notice of federal grants to the state.

The ADO, in accordance with Legislative Act No. 657 of 1969, was given the responsibility to:

> "Provide for the efficient coordination and cooperation in programs of the various governmental and private groups and institutions engaged within this state in promoting the human, economic, and physical resources of the State."

As the result of this responsibility, the State Planning Division of the ADO has published a document, "Goals for Alabama", dated April 1, 1975. This document addresses ten functional areas that encompass the entire spectrum or area for which a community, county, region, or state is responsible for providing services. These functional areas follow:

1. General Government
2. Transportation, Communications, and Utilities
3. Housing
4. Education
5. Natural Resources and Conservation
6. Recreation and Culture
7. Public Safety and Consumer Protection
8. Health Services
9. Social Services
10. Economic Development

Goals and sub-goals for Alabama are summarized in the document for each of the functional areas. However, the document states that this is not a final report but is intended to provide a vehicle for continual review, analysis, and updating of state goals.

Several of the goals relate closely to this study. These goals and the functional areas follow:

Area	Goal
Natural Resource and Conservation	Develop a natural resources program which will enhance and protect the natural environment for the social and economic betterment of the entire state.
Recreation and Culture	Design and implement comprehensive recreational and cultural programs that provide indoor and outdoor recreational and leisure time opportunities.
Economic Development	Encourage economic development in Alabama at greater than the national average, but at the same time protect and conserve natural and human resources to the best extent possible.
Transportation, Communications, and Utilities	Promote the development of an improved, balanced transportation system (air, water, land) which emphasizes the use of existing facilities. Increase the quality and quantity of communications and utilities within Alabama.

Recently, the State Planning Division of ADO published a seven-part series of reports intended to provide a basic framework for the preparation of a State Land Resource Plan. These are intended to provide an overview of the state and to assist federal, state, local, and private agencies in their understanding of the capabilities and constraints for development in Alabama. The seven documents present planning considerations for (1) land use, (2) floods, (3) topography and slope, (4) energy resources, (5) soils, (6) land ownership, and (7) mineral resources.

Alabama Department of Conservation and Natural Resources

The Department is responsible for maintenance, protection, and development of state-owned lands and water, wildlife, and natural resources. There are six separate divisions--Game and Fish, Lands, Marine Resources, Parks, Water Safety, and Administrative. The Department, among many other duties, manages two state parks, five wildlife management areas, and three state-owned or managed lakes within the boundaries of the basin.

Alabama State Forestry Commission

The Commission works in forest protection, development and extension, and provides assistance for enhancement of both rural and urban environmental quality. This agency has three basic divisions: Forest Resource Development; Forest Resource Education; and Forest Resource Protection. Professional foresters and technicians carry out these duties with appropriate fire suppression and management equipment. Close cooperation is maintained with large timber companies who also maintain fire fighting equipment to control wildfire.

Alabama Historical Commission

This Commission assists in landscaping and beautification of projects surrounding heritage buildings, historic, and archaeological sites. The development of nature trails, scenic, and recreational facilities near landmarks are also functions of the Commission. The Commission also has site inventory responsibility.

Alabama Water Improvement Commission

The Commission promotes the conservation of the ground and surface waters of the state and seeks to protect these waters from pollution of any kind. Under the Federal Water Pollution Control Act of 1972 (PL 92-500) and State Act 1260, Regular Session 1971, the Commission is responsible for the preparation of water quality management plans for the entire state--directly in non-designated areas and indirectly in designated areas through coordination with areawide agencies.

Tombigbee Valley Development Authority

The Authority was created by the Alabama legislature in 1967 to facilitate the construction of the Tennessee-Tombigbee Waterway and to develop the water resources of the Tombigbee River and Watershed.

Mississippi Board of Water Commissioners

The Mississippi Code of 1972, under Section 53-3-1, declares policy of the State in regard to the water resources of Mississippi. It provides for implementation of the basic policy with respect to beneficial uses of surface waters.

The 1972 Code, under Section 53-3-15, provides for the creation of the Mississippi Board of Water Commissioners. The Board has responsibility also for administering funds appropriated for the cooperative study of ground water resources. Additional statutory responsibility in

planning has been provided through a section of Senate Bill No. 2506, 1976 regular session of the Mississippi Legislature.

The Board of Water Commissioners is administered by seven members appointed by the Governor. The membership of the Board shall have represented on it at all times at least one member well versed in each major type of water user in the State as follows; recreational, industrial, municipal, and agricultural.

In brief, the Board of Water Commissioners is responsibile for developing a general state water plan to protect existing water rights and control use of additional available water in the future. The Board administers the water rights law of the state and in this connection issues permits for appropriation of surface waters. It also supervises the operation of structures for irrigation, municipal and industrial water use, and approves formation of irrigation, reclamation, and water supply districts. In addition, the Board collects and correlates basic hydrologic data in cooperation with the United States Geological Survey in surface and ground water surveys. Also, the Board has complete arrangements to act as the coordinating agency for studies of land and water resources in Mississippi.

In addition to its legislative responsibilities, the Board of Water Commissioners is designated through the executive branch to administer the program under Title III of PL 89-80, the Water Resources Planning Act. In fulfilling this responsibility, the Board of Water Commissioners oversees the coordination of water resources planning within the state. Further, the Board of Water Commissioners participates in the Water Resources Council's comprehensive (Level B) planning program and the Council's ongoing Regional and National Assessment.

Mississippi Park Commission

This Commission is responsible for developing, managing, and maintenance of state-owned parks. Each park has personnel to operate the facilities. Parks differ in size, degree of development, and emphasis offered for visitors. There is one park in the Mississippi portion of the basin.

Mississippi Forestry Commission

The Commission is assigned responsibilities designed to help all Mississippians enjoy a better life through more productive forests and industries. Primary programs administered are fire protection, forest management, insect and disease control, and information and education. The Commission maintains a system of county foresters, technicians, specialists, and excellent fire detection and suppression equipment in performing their duties.

Tombigbee River Valley Water Management District

The creation of the Tombigbee River Valley Water Management District was enacted by the Mississippi Legislature in 1962. The District was officially organized in April, 1963 with seven counties. Presently, the District has twelve counties as members. These are Alcorn, Chickasaw, Clay, Itawamba, Kemper, Lee, Lowndes, Monroe, Noxubee, Pontotoc, Prentiss, and Tishomingo. Five additional counties--Choctaw, Oktibbeha, Tippah, Union, and Webster--are eligible to become members. The District is a state agency.

The main objective is to cooperate with every local, state, and federal organization that has to do with the conservation and development of the natural resources and the human resources in the economic development of the District by multiple county activities: also, (1) to assist in the implementation of the U. S. Corps of Engineers' authorized Tennessee-Tombigbee Waterway Project; (2) to continue to sponsor the implementation of the Corps of Engineers' authorized Flood Control Project, Tombigbee River and Tributaries; (3) to assist in the authorized Corps of Engineers' Comprehensive Tombigbee River Basin Study; (4) to sponsor the proposed Yellow Creek Port in Tishomingo County; (5) to cosponsor the U. S. Department of Agriculture's Flood Prevention Program; (6) to sponsor the approved Northeast Mississippi Resources Conservation and Development Program; (7) to sponsor the Water Resources Planning Act; (8) to cooperate with the State Air & Water Pollution Commission; and (9) to provide public parks and recreation facilities within the District, and for the preservation of fish and wildlife.

The Tombigbee River Valley Water Management District has provided and continues to provide assistance to many projects located in the member counties by acting as local sponsors and by providing financial assistance. Examples of this assistance are (1) provide planning funds for planning of watershed projects, PL-566 and RC&D projects; (2) provide funds for critical area land treatment; (3) provide funds for county recreational plans; (4) provide funds for historical and archaeological studies for selected areas or sites; (5) assist local districts by providing funds required for construction projects--right-of-way costs; (6) provide funds for a comprehensive water quality, transportation, and land use study for the Tombigbee River Basin in Mississippi; and (7) provide assistance in the completion of the Tennessee-Tombigbee Waterway and other related facilities to the waterway.

Mississippi Game and Fish Commission

The Mississippi Game and Fish Commission is charged with the overall responsibility of the state game and fish resource. Law enforcement, management of fish and game populations on state and private areas, and research are vital functions of the Commission program.

All counties have conservation officers that provide basic law enforcement leadership. These officers also assist in other duties relating to management, public relations, and research.

Assistance to private landowners and hunting clubs in the management of game and fish populations is everyday work for Commission biologists and technicians. Within the basin boundaries there are three wildlife management areas and four state-owned or managed lakes that involve management responsibilities of Commission biologists and technicians. Additionally, game and fish personnel assist state parks, colleges, and other institutional lands with wildlife and fisheries management assistance.

Mississippi Department of Archives and History

This department is responsible for preparing inventories and evaluations of historical and archaeological sites and working closely with other state and federal agencies to see that such sites are protected, preserved and used to the advantage of people of this generation and those yet to come. Much work has recently been done in preparing a statewide comprehensive historic preservation plan. This plan and other educational efforts by department personnel are beginning to create more awareness about the scope and significance of our historical heritage among Mississippians.

Soil Conservation Districts

Soil conservation districts have provided educational programs and technical services to the basin's district cooperators. Most of these cooperators own forest land. The Soil Conservation Service, Extension Service, Forest Service, State Forestry Departments, and other agencies work through the districts in applying conservation planning and conservation programs to private farm and forest lands. Most conservation districts have committees dealing with forestry problems at state and local levels.

The educational programs of the districts, relating to forestry and the small non-industrial forest landowners, are carried on as a part of the district's on-going educational program in resource conservation and management. Intensified programs have been conducted by districts in the examples of the "Third Forest," the Tennessee Valley Authority program, and others.

An important aspect of the Soil Conservation District Program is in the area of providing services to the small, non-industrial forest landowner. In some areas, this service, in the form of site preparation, planting, and timber stand improvement is available only through the districts. In other districts they are the primary source of service.

Planning and Development Organizations

Public Law 90-577, the Intergovernmental Cooperation Act of 1968, and Part IV of U. S. Office of Management and Budget Circular No. A-95, Revised, encourages the states "to exercise leadership in delineating and establishing a system of planning and development districts or regions in each state, which can provide a consistent geographic base for coordination of federal, state, and local development programs" in order to "minimize inconsistency among regional, metropolitan development planning activities" and to "eliminate overlap, duplication, and competition in state and local planning activities assisted or required under federal programs and to encourage the most effective use of state and local resources available for development planning."

An increasing number of federal, state, and local assistance programs require a sub-state, multi-jurisdictional structure in order to preserve the eligibility of state and local governments to participate in certain federally assisted programs and projects. Alabama and Mississippi are organized into such commissions and districts that have boundaries that represent national, social, and economic relationships, and have proved effective in the planning, coordination, and administration of many public programs and projects. These commissions and districts seek to achieve comprehensive, logical development of each commission or district, thereby, ensuring sound economic growth while protecting the citizens welfare and providing for proper use of resources. Environmental improvements and maintenance are of major concern.

Alabama is sub-divided into twelve regional commissions. Parts of three of these commissions make up the most of the Alabama part of the basin. However, Walker and Mobile Counties, each with a very small area in the basin, are parts of two other commissions.

Mississippi is sub-divided into ten regional districts. Parts of four of these districts make up the Mississippi part of the basin. The seven commissions or districts of the Tombigbee River Basin are listed below, along with the counties of each that are located entirely or partly in the basin (map 2.2).

Alabama

1 Northwest Alabama Council of Local Governments - Franklin, Marion, and Winston Counties.

2 West Alabama Planning and Development Council - Fayette, Greene, Hale, Lamar, Pickens, and Tuscaloosa Counties.

6 Alabama-Tombigbee Rivers Regional Planning and Development Commission - Choctaw, Clarke, Marengo, Sumter, and Washington Counties.

Mississippi

2 Northeast Mississippi Planning and Development District - Prentiss, Tippah, and Tishomingo Counties.

5 Three Rivers Planning and Development District - Chickasaw, Itawamba, Lee, Monroe, Pontotoc, and Union Counties.

6 Golden Triangle Planning and Development District - Choctaw, Clay, Lowndes, Noxubee, Oktibbeha, Webster, and Winston Counties.

8 East Central Mississippi Planning and Development District - Clarke, Kemper, and Lauderdale Counties.

CHAPTER VI

FUTURE WITHOUT PLAN CONDITIONS

General

Commencing with conditions that exist at present in the basin, projections of the future without plan conditions were made to provide a basis for evaluating beneficial and adverse effects that may accrue as a result of a plan. Water and related land resource use and economic, social, and environmental conditions are not static and changes are anticipated to occur even without a project or plan. Thus, the primary function of the suggested plan presented in Chapter IX is to minimize or alleviate undesirable conditions or satisfy a need that exists or will exist in the future because the on-going programs are not sufficiently responsive.

The inadequacy of existing programs to cope with projected resource problems and needs is due in part to a number of reasons. Programs are currently available that with effective implementation can improve conditions relating to agriculture; however, financial commitments and restraints usually determine how effective and continuous these programs are. Also, new programs will emerge and old ones are subject to change or cancellation.

To predict what will happen in the future is fraught with questions concerning the reliability of the projection techniques and the resulting parameters. Projections, at best, are conditional forecasts of the future. The general conclusion, as is the case with all forecasts, is not really an attempt to foresee the future. Resource planners or professional forecasters can only evaluate the implications of certain trends, and--given certain assumptions about future events--extend these trends into the future. If unforeseen events occur, the predictions do not come about.

Existing Projects and Programs

The future without plan conditions reflect the basin's future based on the continuation of present programs but at uncertain rates. Some programs change from year to year while others remain constant or are cancelled. Generally, the following outlines the on-going programs that affect the problems and conditions in the basin.

Flooding - Projections of flood damages were made for the upstream watersheds. Existing programs to reduce upstream flooding are discussed in Chapter V and include the Watershed Protection and Flood Prevention

Act (Public Law 566) and the Resource Conservation and Development Program. The watershed projects and the RC&D project measures that are planned and approved for operation were assumed to be complete by 1990.

Land Treatment - Projections of land treatment needs were made. These needs include measures to reduce erosion and wetness hazards, sediment yields and to improve crop and pasture yields.

Programs available to reduce the treatment needs include the watershed projects under Public Law 566 and the planned RC&D project measures. These projects include critical area treatment as well as other conservation measures.

Other programs exist that affect these treatment needs each year. Some programs provide only technical assistance. Others provide technical and some financial assistance. These programs include Soil and Water Service Establishing Act (Public Law 46), Agricultural Stabilization and Conservation Service assistance, Extension Service assistance, and U. S. Forest Service programs, among others. Estimates of the effects that these programs will have on the future needs were not made.

Sediment Yields - The reduction of sediment yield will be the result of installation of flood damage reduction and land treatment measures. Programs for the installations of these measures are identified above.

Other - Other components including recreation activities, hunting and fishing supplies, and preserving of scenic, historical, and archaeological sites are affected by activities of several local, state, and federal programs. Recreation facilities identified include those presently existing. Authorized projects, planned or being planned, were not identified during the study. However, the RC&D program and the watershed program, among others, provide means to meet recreation needs.

Hunting and fishing projections were made. Existing resources are more than adequate to meet projected demands. Programs are available that will improve hunting and fishing opportunities.

Projections for scenic, historic, and archaeological sites to be preserved assumed that existing programs of Alabama, Mississippi, and local agencies would accomplish these tasks with some federal help. The Alabama Historical Commission and the Mississippi Department of Archives and History, within their limited authority, would provide for the preservation or protection of identified historic and archaeological sites. The preservation and identification of the scenic sites will depend on local, state, and federal programs concerned with such areas.

General Description of Future Without Plan Conditions

Land Use

Projected land use data for future without plan conditions are presented in table 6.1. These data were developed in part through the use of a least-cost linear programming model as described in Chapter IV. Also, inherent in the estimates are the assumptions that follow.

1. Forest products will accrue from acreage that remains after other higher priority land and water use demands are met.

2. Use of land capability Classes V, VI, and VII for cropland and pastureland will continue at about the same as present rates.

3. Some cropland and pastureland acreage, especially on soils with limitations, will not be adequately treated and some deterioration of the land base will occur.

4. The acreage requirements projected for cropland and pastureland is not inclusive of that needed for installation of conservation practices.

5. Conservation practices will continue to be installed but at a rate that will not protect the land base.

6. Crop yields will increase at a rate less than the historic trend. Yields will increase approximately 15 percent between 1970 and 1990 and 15 percent between 1990 and 2020.

Total cropland is projected to increase from 1.3 million acres in 1970 to 1.4 million acres in 1990, and to 1.5 million acres in 2020. Harvested cropland increases from 936.8 thousand acres in 1970 to 972.1 thousand acres in 1990, and to 1.2 million acres in 2020. Pastured cropland is projected to increase in each future time frame. There is a modest increase in idle cropland between 1970 and 1990; however, considerable acreage is returned to production of crops by the year 2020.

Permanent pastureland increases by 238.8 thousand acres during the period 1970 to 2020. Currently only 39 percent of the permanent pasture is improved and 61 percent unimproved. By 2020, approximately 88 percent is projected to be improved and only 12 percent unimproved.

Forestland is projected to decrease from 5.8 million acres in 1970 to 5.2 million acres in 2020. As previously enumerated in the assumptions, forestland is regarded as a residual use after other competitive uses are met.

Other uses increases 150.9 thousand acres between 1970 and 2020. This land use category includes all other land uses and water areas.

Table 6.1. Land use for future without plan conditions, Tombigbee River Basin, 1970 and projected 1990 and 2020

Major use	1970	1990	2020
	1,000 acres	1,000 acres	1,000 acres
Cropland			
Harvested	936.8	972.1	1,204.0
Pastured	46.8	96.4	120.4
Idle	289.3	302.0	125.8
Total	1,272.9	1,370.5	1,450.2
Pastureland			
Improved	494.9	826.0	1,342.1
Unimproved	783.5	575.2	175.1
Total	1,278.4	1,401.2	1,517.2
Forestland 1/	5,785.3	5,487.3	5,218.3
Other uses 2/	466.5	544.1	617.4
Total	8,803.1	8,803.1	8,803.1

Source: Formulated by River Basin Survey Staff, United States Department of Agriculture.

1/ Includes all federal land.
2/ Includes all other land and water areas.

Agricultural Production

Projected crop and livestock production for the future without plan conditions are presented in table 6.2. Commodity output, when translated into land requirements, provides insight into the ability of the land and water resources to meet alternative levels of projected demand for food and fiber.

Projected production of cotton is 53.6 thousand bales in 1990 and 25.6 thousand bales in 2020. The estimates are regarded as somewhat conservative. However, historical trend data suggests that cotton production and acreage is trending downward. The level to which cotton will decrease or to which it will increase is dependent upon factors such as prices, cost of production, effective control of insects and diseases, alternative enterprises, labor, and availability of resources, among others.

Table 6.2. Projected agricultural production for future without plan conditions, Tombigbee River Basin, 1990 and 2020

Crop	Unit	1990	2020
		1,000	1,000
Cotton	Bales	53.6	25.6
Soybeans	Bushels	15,797.7	20,109.0
Corn	Bushels	2,646.0	3,291.3
Wheat	Bushels	925.1	4,956.8
Hay	Tons	299.2	215.7
Pasture	AUM	4,685.2	8,455.2

Source: Economic Research Service and Soil Conservation Service, United States Department of Agriculture.

The production of soybeans has proven to be an attractive competitive cash crop enterprise for many farmers. Unless the national and world situation changes drastically, soybeans will likely remain as a viable crop in the basin.

Corn, with few exceptions, has never been regarded as an important cash crop in the basin. The basin is now and will continue to be a deficit grain producing area.

Wheat is not a new crop to Alabama or Mississippi; however, the future of this crop is questionable since the trend in acreage has been extremely erratic over time. The practice of following wheat with soybeans will certainly have an impact on the acreage of both crops.

Livestock production is very important in the basin and will likely continue into the future. The basin is well endowed with suitable land for beef and dairy enterprises. The future for grass-fed beef is most optimistic and trend data suggest that an increasing level of output will be achieved.

To sustain the projected level of production of crops and livestock will impose a greater demand on each acre of land. Also, some reduction in the quality of the land resource base will likely occur for the future

without plan conditions. Projected production for the without condition is consistent with OBERS projections of food and fiber production in a larger area including all of Alabama and the Mississippi portion of the Tombigbee.

Forestry Production

Forestry production requirements cannot be met for the future without plan conditions. Acreage will decline to 5.5 million acres in 1990 and to 5.2 million acres in 2020. The decline in acreage during the period 1970 to 2020 is 567.0 thousand acres.

Annual growth is projected to increase from 57 cubic feet per acre in 1970 to 78 cubic feet in 2020. As a result, the supply of forest products will increase from 206 million cubic feet in 1970 to 414 million cubic feet in 1990, and to 408 million cubic feet in 2020. This supply will fall short of meeting projected demands. There will be a deficit of 92 million cubic feet in 2020 (figure 6.1).

Specific Description of Future Without Plan Conditions

Flooding

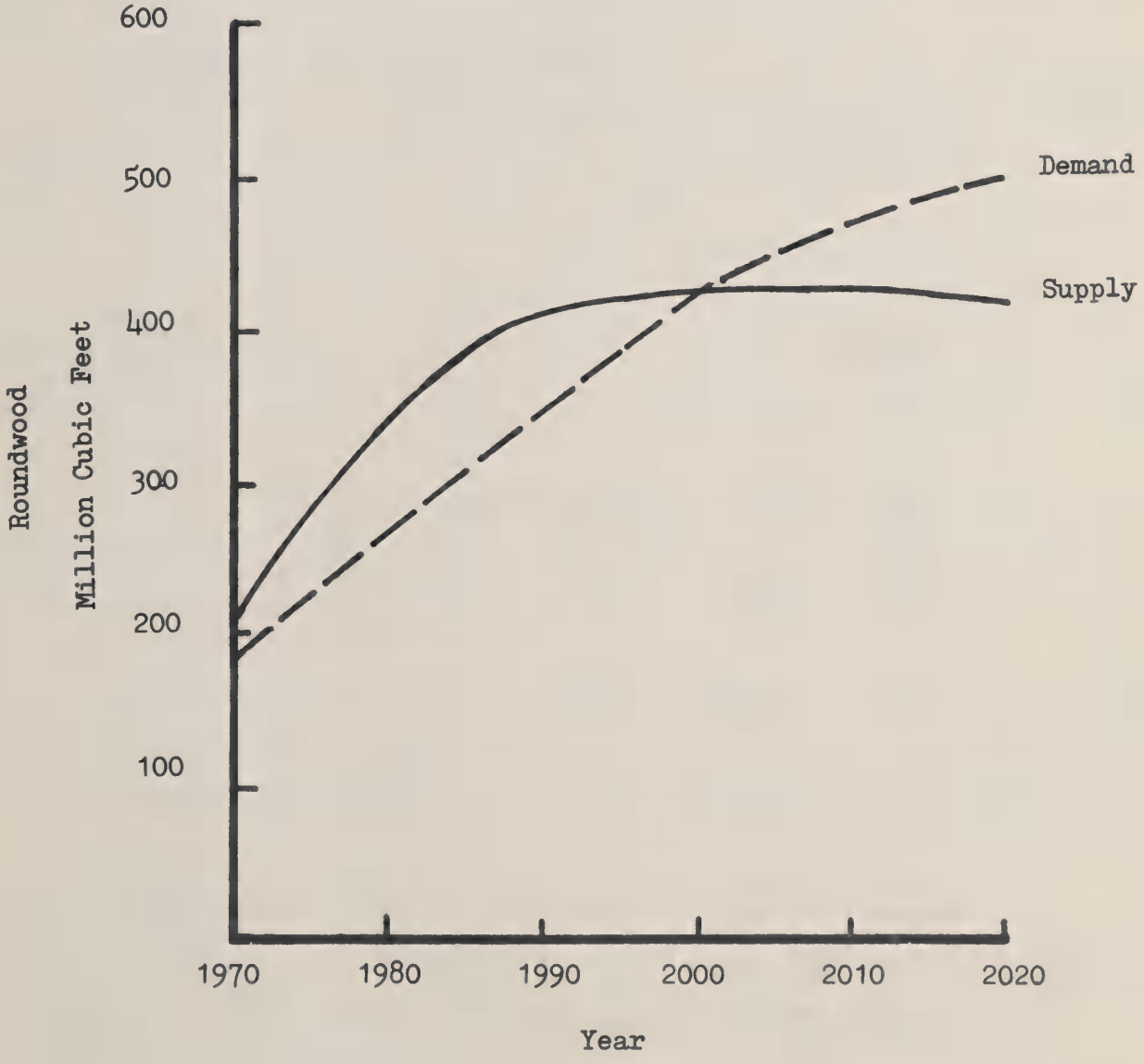
Future without plan conditions indicate that upstream flood damages will be reduced by a minimal amount. The 1.4 million acres presently being flooded in the upstream watersheds will be reduced by the year 1990 to 1.3 million acres by the existing programs as identified in Chapter V. Flood damages, based on 1970 values, will also be reduced about $868 thousand annually.

The present and projected without plan flood damages and areas subject to flooding in the upstream watersheds are displayed by sub-basin and basin in table 6.3. The flood damages are $11.9 million in 1970, $14.2 million in 1990, and $20.8 million in 2020. The increase in damages results primarily from an increase in the quantity and associated value of agricultural products produced, rather than from extensive land use changes.

Land Treatment

The production obtained as well as the continued quality of the land base are influenced by the demands made by man and how he manages the land resource. Under the without plan conditions, many acres will continue to be used to produce but will not be adequately treated. Therefore, the quality of the resource base will deteriorate.

Figure 6.1. Roundwood demand and supply for future without, Tombigbee River Basin, 1970 and projected 1990 and 2020



Source: Forest Service, United States Department of Agriculture.

Table 6.3. Upstream watershed flood damages without plan conditions, by sub-basin, Tombigbee River Basin, 1970 and projected 1990 and 2020

Sub-basin	Item	Unit	Year		
			1970	1990	2020
			Thousands	Thousands	Thousands
34 Upper	Area	Acres	261.7	261.6	261.6
	Damage	Dollars	2,298.7	2,966.8	4,336.0
34 Lower	Area	Acres	379.7	372.9	372.9
	Damage	Dollars	1,804.0	2,320.5	3,391.5
34a	Area	Acres	156.6	124.7	124.7
	Damage	Dollars	1,948.1	1,958.9	2,863.0
34b	Area	Acres	96.1	96.1	96.1
	Damage	Dollars	592.0	769.7	1,124.9
34c	Area	Acres	88.0	88.0	88.0
	Damage	Dollars	714.5	928.8	1,357.5
34d	Area	Acres	129.9	84.9	84.9
	Damage	Dollars	1,636.7	1,615.3	2,360.8
34e	Area	Acres	68.8	68.8	68.8
	Damage	Dollars	584.6	760.0	1,110.8
34f	Area	Acres	165.7	163.2	163.2
	Damage	Dollars	1,764.5	2,184.2	3,192.5
34h	Area	Acres	90.7	90.0	90.0
	Damage	Dollars	593.4	736.0	1,075.6
Basin	Area	Acres	1,437.2	1,350.2	1,350.2
	Damage	Dollars	11,936.5	14,240.2	20,812.6

Source: Soil Conservation Service, United States Department of Agriculture.

The continued wetness hazard on cropland and pastureland means that management will be more difficult and reduced yields will occur. The projected acres of land with these hazards for the without plan conditions are shown in table 6.4. Cropland with a wetness hazard is projected to be 553.3 thousand acres in 1990 and 586.8 thousand acres in 2020. Pastureland with a wetness hazard is projected to be 418.3 thousand acres in 1990 and 360.8 thousand acres in 2020.

Erosion, under the without plan conditions, continues on critical problem areas such as gullies, roadbanks, streambanks, strip mines, and on some acres of cropland, pastureland, and forestland. In addition, erosion will continue to occur on non-critical areas.

Projections for the without plan conditions were made for land with an erosion problem. Erosion is now and will continue to be a problem in both 1990 and 2020. Acres with an erosion problem by source and major land use for each sub-basin and for the basin are presented in table 6.5. Also, streambank miles are shown.

The basin total critical acres by source are as follows: gullies, 27.9 thousand in 1990 and 2020; roadbanks, 10.8 thousand in 1990 and 2020; strip mines, 18.8 thousand in 1990 and 2020; cropland, 76.0 thousand in 1990 and 66.5 thousand in 2020; pastureland, 111.8 thousand in 1990 and 2020; and forestland, 77.5 thousand in 1990 and 2020. Streambanks with a critical erosion problem total 763 miles in 1990 and 2020.

Other sources and acreages of erosion for the without plan conditions are (1) cropland, 401.1 thousand acres in 1990 and 426.6 thousand acres in 2020; (2) pastureland, 415.9 thousand acres in 1990 and 372.3 thousand acres in 2020; and (3) forestland, 2.3 million acres in both 1990 and 2020.

The without plan conditions suggest that many acres of land will continue to be used to produce but will not be adequately protected. Erosion will continue to be a major problem and the quality of the land will be reduced. Gross erosion for the future without plan conditions is 63.7 million tons annually by 1990 and 65.5 million tons by the year 2020. Basinwide, this amounts annually to 7.2 tons per acre in 1990 and to 7.4 tons per acre in 2020.

Sediment, resulting from the continued erosion projected to occur under the without plan conditions, will continue to be a problem in the future. Sediment yields for these conditions are shown in table 6.6. The 13.2 million tons of sediment yield projected for 1990 amounts to 1.51 tons per acre per year. This yield will increase slightly to 1.54 tons per acre per year by 2020.

Sediment will continue to fill streams and rivers, thereby causing other problems such as flooding and excessive maintenance along these water courses and waterways. Water quality will continue to be affected.

Table 6.4. Cropland and pastureland with a wetness problem for future without plan conditions, by source and sub-basin, Tombigbee River Basin, 1970 and projected 1990 and 2020

Sub-basin and land use	1970	1990	2020
	Acres	Acres	Acres
34 Upper			
Cropland	60,400	69,000	99,200
Pastureland	82,300	86,700	52,000
34 Lower			
Cropland	46,800	44,500	98,100
Pastureland	104,500	124,600	64,500
34a			
Cropland	91,100	85,200	53,800
Pastureland	26,400	43,600	72,900
34b			
Cropland	128,100	150,300	128,700
Pastureland	19,594	11,394	31,794
34c			
Cropland	20,400	38,100	23,200
Pastureland	14,678	1,478	16,178
34d			
Cropland	81,900	76,919	90,619
Pastureland	71,500	46,720	29,420
34e			
Cropland	17,000	20,400	17,600
Pastureland	14,400	15,100	17,700
34f			
Cropland	48,700	56,570	61,070
Pastureland	65,300	62,950	54,850
34h			
Cropland	7,700	12,300	14,500
Pastureland	25,700	25,800	21,500
Basin			
Cropland	502,100	553,289	586,789
Pastureland	424,372	418,342	360,842

Source: Soil Conservation Service, United States Department of Agriculture.

Table 6.5. Land with erosion problems, critical and other, for future without plan conditions, by sources and sub-basin, Tombigbee River Basin, 1970 and projected 1990 and 2020 1/

Source and major land use	Year	Unit	Sub-basin									Basin total
			34 Upper	34 Lower	34a	34b	34c	34d	34e	34f	34h	
Critical problems												
Gullies	1970	Acres	6,931	6,236	3,472	2,053	799	6,239	575	3,813	1,000	31,118
	1990	Acres	6,929	6,186	2,647	1,853	796	4,179	575	3,763	965	27,893
Roadbanks	1970	Acres	3,116	4,700	892	531	193	705	567	995	540	12,239
	1990	Acres	3,018	4,670	381	486	156	182	567	829	582	10,821
Strip mines	1970	Acres	6,663	1,056	3,354	557	4,587	733	880	896	64	18,790
Streambanks	1970	Miles	95	208	54	71	48	103	28	126	30	763
Cropland	1970	Acres	9,462	11,500	20,800	16,900	7,600	14,300	4,600	4,900	4,600	94,662
	1990	Acres	8,516	10,250	17,008	14,410	6,840	6,370	4,140	4,310	4,108	75,952
	2020	Acres	7,570	9,100	14,928	12,720	6,080	4,940	3,680	3,820	3,648	66,486
Pastureland	1970	Acres	21,300	5,577	4,896	12,713	4,300	23,940	7,200	21,122	12,775	113,823
	1990	Acres	21,300	5,477	4,896	12,413	4,300	22,360	7,200	21,122	12,775	111,843
Forestland	1970	Acres	10,703	13,029	4,354	7,539	1,641	14,991	4,238	16,078	4,936	77,509
Other problems 2/												
Cropland	1970	Acres	67,600	90,900	57,500	27,200	43,200	12,200	33,800	24,200	16,500	373,100
	1990	Acres	73,463	88,900	44,200	44,000	56,500	8,700	36,400	29,200	19,735	401,098
	2020	Acres	96,263	129,300	20,600	27,600	45,400	19,000	34,200	32,700	21,535	426,598
Pastureland	1970	Acres	60,200	132,723	39,704	30,642	12,200	59,760	13,200	57,878	47,525	453,832
	1990	Acres	63,335	146,923	47,204	24,442	2,300	16,760	13,800	54,678	46,462	415,904
	2020	Acres	37,035	101,623	69,404	39,842	13,300	3,660	15,600	48,578	43,262	372,304
Forestland	1970	Acres	348,627	795,692	216,052	93,102	223,246	93,741	223,503	146,663	167,819	2,308,445
	1990	Acres	348,627	795,192	206,652	93,102	223,246	68,226	223,503	142,663	167,019	2,268,230

Source: Soil Conservation Service, United States Department of Agriculture.

1/ Where 1990 and 2020 data not shown, projection assumed constant.

2/ These acres primarily need management systems to improve production efficiency.

Where the sediment is deposited on land in excessive amounts, land is damaged and may take years to recover.

Recreation

Land and water acreages devoted to or used exclusively for selected recreational pursuits are asumed to be the same as shown in table 5.9. This assumption was necessitated due to the absence of any definitive data concerning recreation developments by the public or private sector.

Table 6.6. Sediment yield for future without plan conditions, by sub-basin, Tombigbee River Basin, 1970 and projected 1990 and 2020

Sub-basin	Item	Unit	Year		
			1970	1990	2020
			Thousands	Thousands	Thousands
34 Upper	Yield	Tons	4,000	4,000	4,000
34 Lower	Yield	Tons	3,925	3,900	3,900
34a	Yield	Tons	998	810	910
34b	Yield	Tons	704	324	370
34c	Yield	Tons	776	776	776
34d	Yield	Tons	1,050	686	736
34e	Yield	Tons	935	895	895
34f	Yield	Tons	1,200	1,170	1,270
34h	Yield	Tons	705	705	705
Basin	Yield	Tons	14,293	13,266	13,562

Source: Soil Conservation Service, United States Department of Agriculture.

Hunting and Fishing

Hunting and fishing supply, demand, and needs for future without plan conditions are shown in table 6.7. The data are based on resident licensed hunters and fishermen. Inherent in the data is the assumption that the supply will remain constant throughout the study period. Obviously, changes will occur; however, it is further assumed that losses and gains in supplies will be offsetting and total supplies will remain essentially the same.

Table 6.7. Resident hunting and fishing supply, demand, and needs for future without plan conditions, Tombigbee River Basin, 1970-1975 and projected 1990 and 2020

Item	Hunting				Fishing			
	Year	Supply	Demand	Needs	Year	Supply	Demand	Needs
		Man-days				Man-days		
Mississippi	1975	1,271,074	1,065,672	0	1970	1,722,400	613,800	0
	1990	1,271,074	1,243,645	0	1990	1,722,400	775,800	0
	2020	1,271,074	1,592,010	320,936	2020	1,722,400	991,800	0
Alabama	1975	1,022,354	758,736	0	1970	792,700	377,400	0
	1990	1,022,354	853,380	0	1990	792,700	443,700	0
	2020	1,022,354	1,092,960	70,606	2020	792,700	567,800	0
Basin	1975	2,293,428	1,824,408	0	1970	2,515,100	991,200	0
	1990	2,293,428	2,097,025	0	1990	2,515,100	1,219,500	0
	2020	2,293,428	2,684,970	391,542	2020	2,515,100	1,559,600	0

Source: Soil Conservation Service, United States Department of Agriculture.

Other Conditions

Table 6.8 shows the scenic, historical, archaeological, and ecological sites estimated to be preserved under future without plan conditions. These estimates were developed assuming that those areas without active programs and funding will be lost (ecological) and those having active programs and funds would retain most of the present inventory (historic and archaeological).

An intensive inventory and categorization of scenic areas were not conducted. There are some federal and state regulations regarding destruction of these areas by projects planned or funded by federal or state funds. However, there are no real restrictions on private actions which would damage scenic areas. Very few areas are under any type of management for the purpose of retaining or improving their quality.

The foreseeable future without plan condition accomplishments will be slow in properly addressing the problem of identifying and managing scenic areas. There will be some social pressures exerted, but these will be overshadowed by economic realities and more pressing immediate demands.

Ecosystems are not as easily defined, identified, given a value, or protected. Foreseeable future without plan conditions will provide social and economic leverage to further manage these resources for man's use as well as a part of the natural environment.

State and federal action to insure that historic sites are preserved is supplemented by considerable local action. Much concern is expressed over the loss of historical sites in this basin that has been so much a part of recent historical events. Efforts will be exerted to preserve remaining sites.

Table 6.8. Scenic, historical, archaeological, and ecological sites to be preserved under future without plan conditions, Tombigbee River Basin, 1990 and 2020

Item	Scenic	Historic	Archaeological	Ecological
	Sites	Sites	Sites	Sites
Mississippi				
1990	8	96	25	0
2020	16	112	50	0
Alabama				
1990	10	177	5	0
2020	20	207	10	0
Basin				
1990	18	273	30	0
2020	36	319	60	0

Source: Soil Conservation Service, United States Department of Agriculture.

CHAPTER VII

NEEDS

General

Needs were developed for this study to address basin problems discussed in Chapter III. Study concerns were established in the Plan of Work and modified as the study progressed. These study concerns were translated into specific components for either the National Economic Development Objective or the Environmental Quality Objective. Desired outputs were also identified for the specific components as presented in Chapter III.

Projections for future conditions concerning agricultural production were made and presented in Chapter IV. The basin resources are described in Chapter V. Existing programs that will reduce present problems were also identified in Chapter V. The future without plan conditions were established for identified problems and presented in Chapter VI. Component needs were identified for the National Economic Development and the Environmental Quality Objectives by studying and analyzing the existing and projected problems relating to specific study concerns. The needs relate to the identified problems to insure improved resource use efficiency.

The component needs reflect the desires of the public as interpreted from the study concerns. The needs presented in this chapter are also practical and reasonable. However, solutions may be limited by existing authorities and in some cases new legislation may be required.

The development of alternative plans depends on the component needs since proposed plan elements should provide for all or part of these needs. Each plan's effectiveness is tested by the amount of each component need provided.

Component Needs - NED

Flood Damage Reduction

The basin upstream watersheds or watershed groups were all investigated and total flood damages were established for each watershed or group. Potentials for reducing floodwater damages were established by evaluating most watersheds or groups with alternative structural measures. Structural measures included (1) floodwater retarding structures only, (2) channels only, and (3) combinations of floodwater retarding structures and channels. Stabilization measures were included, if needed.

Improved channel criteria provided for the 0.25, 0.50, and the 1.0 year frequency designs. Floodwater retarding structure control ranged up to 50 percent. Each system of retarding structures included an evaluation with no channel and with the three channel designs as outlined above. Structural costs and damage reduction were established as were benefit-cost ratios.

Some of the alternative measures included in each watershed or group resulted in uneconomical projects and others were economical. The analysis provided the basis by which individual watersheds or watershed groups with a potential were established (table 7.1). A total of 33 watersheds or groups, as identified on map 7.1, have the potential for projects that will provide for a program to reduce flood damages using present criteria.

Total upstream flood damages are shown in table 6.3. The component needs by sub-basins for the upstream watersheds within the basin are shown in table 7.2. This table presents the dollar damages and the acres subject to flooding for the 33 watersheds with a potential for a program to reduce flood damages.

Wetness Hazard Damage Reduction

The present wetness problems on cropland and pastureland were identified and discussed in Chapter III. Projections and the effects of existing programs resulted in the future without plan conditions presented in Chapter VI.

Every acre with a wetness problem should be treated if the desired yields and the beneficial effects of installation of other conservation practices are to be realized. Component needs for cropland and pastureland are the same as presented in Chapter VI. Refer to table 6.4 for acres requiring treatment in each sub-basin and to table 7.4 for the basin summary.

Critical Area Erosion Damage Reduction

Present problems and projections of the magnitude of critical erosion are discussed in previous chapters. Critical areas include gullies, streambanks, strip mines, cropland, pastureland, and forestland. The component needs for acres needing treatment to reduce critical erosion damage are shown by sub-basins in table 6.5. The summary for the NED objective is shown in table 7.4.

Management Systems

Many acres of cropland, pastureland, and forestland need conservation treatment to reduce erosion and provide other benefits. These acres are

Table 7.1. Upstream watershed projects for flood damage reduction, by sub-basin, Tombigbee River Basin, 1975

(NED objective)

Watershed status [1]	Sub-basin 34a	34b	34c	34d	34e	34f	34h	34 upper	34 lower	Basin total
	Number of watersheds									
(1) Completed	0	0	0	[2] 1	1	1	0	[2] 1	0	4
(2) In operation (construction begun)	1	2	0	1	0	0	0	0	[3] 1	5
(3) Approved for operation	1	0	0	2	0	1	[2] 1	[2] 1	0	6
Sub-total	2	2	0	4	1	2	1	2	1	15
(4) Potential projects	4	2	2	3	2	6	2	8	4	33
(5) No potential	0	0	1	0	1	1	4	5	18	30

Source: Soil Conservation Service, United States Department of Agriculture.

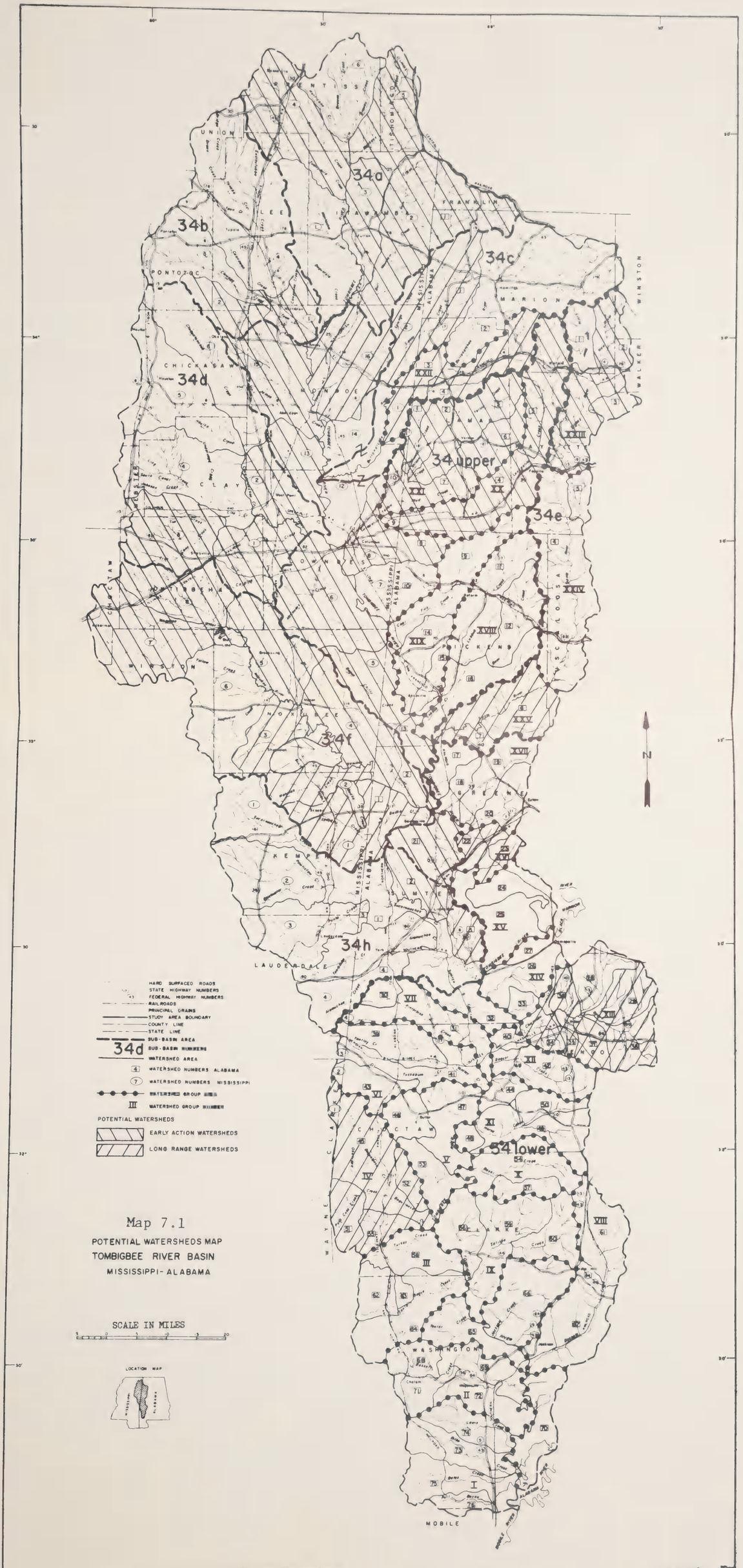
[1] Item 3 is assumed as existing by 1990.
Sums of items 1 and 2 are assumed complete.
[2] RC&D project measures.
[3] Project is inactive.

Table 7.2. Upstream flood damage reduction component needs by sub-basin, Tombigbee River Basin, 1970 and projected 1990 and 2020

(NED Objective)

Sub-basin	Item	Unit	Year		
			1970	1990	2020
			Thousands	Thousands	Thousands
34 Upper	Area	Acres	186.1	186.1	186.1
	Damage	Dollars	2,104.3	2,735.6	3,998.2
34 Lower	Area	Acres	71.7	71.7	71.7
	Damage	Dollars	681.4	885.8	1,294.7
34a	Area	Acres	113.8	113.8	113.8
	Damage	Dollars	1,396.2	1,815.1	2,652.8
34b	Area	Acres	20.4	20.4	20.4
	Damage	Dollars	293.8	381.9	558.2
34c	Area	Acres	45.8	45.8	45.8
	Damage	Dollars	481.8	626.3	915.4
34d	Area	Acres	53.0	53.0	53.0
	Damage	Dollars	676.6	879.6	1,285.5
34e	Area	Acres	35.1	35.1	35.1
	Damage	Dollars	484.8	630.2	921.1
34f	Area	Acres	137.0	137.0	137.0
	Damage	Dollars	1,627.4	2,115.6	3,092.1
34h	Area	Acres	27.7	27.7	27.7
	Damage	Dollars	127.4	165.6	242.1
Basin	Area	Acres	690.6	690.6	690.6
	Damage	Dollars	7,873.7	10,235.7	14,960.1

Source: Soil Conservation Service, United States Department of Agriculture.



Map 7.1

POTENTIAL WATERSHEDS MAP
TOMBIGBEE RIVER BASIN
MISSISSIPPI- ALABAMA

Source: Soil Conservation Service,
United States Department of Agriculture

August, 1976

those that need a conservation management system to reduce erosion, increase yields, and protect the land base.

The acres for each major land use by sub-basins that require a management system are those shown in table 6.5. The basin summary for these component needs is shown in table 7.4. Component needs for forest land are for improved production efficiency.

Land

Component needs for land were categorized and determined for four major uses--cropland, pastureland, forestland, and other land. The "other" land use category includes urban and built-up areas, miscellaneous lands, and water areas.

Component needs therefore represent the land required to sustain most or all the demands placed on each use category. Land needs are synonymous with the acreages for the NED alternative presented in Chapt VIII (table 8.1).

Projected cropland needs are 1,272.7 thousand acres in 1990 and 1,330.5 thousand acres in 2020. Pastureland needs are projected to be 1,321.3 thousand acres in 1990 and 1,220.2 thousand acres in 2020. Projected forestland needs are 5,665.0 thousand acres in 1990 and 5,635.0 thousand acres in 2020. Other land, as previously defined, increases from 466.5 thousand acres in 1970 to 617.4 thousand acres in 2020, an increase of 150.9 thousand acres. This increase is sufficient to satisfy projected demand for this land base.

Recreation

Present and projected component needs for recreation are presented in table 7.3. Depending on the recreational pursuit, the needs are expressed in different units--activity occasions, water acreage, and land acreage.

The needs data portray those districts within the basin that have surpluses or deficits of recreational facilities, land, and water. Swimming and picnicking are the two activities with the greatest needs. Resources and facilities for boating and hiking are generally more than adequate to support needs.

Hunting

Hunting component needs for resident licensed sportsmen are shown in table 6.7. The basin summary is shown in table 7.4. There are no needs prior to the year 2020 and very small needs then. Although these

Table 7.3. Recreation resource component needs[1/] by planning and development districts, Tombigbee River Basin, 1970 and projected 1990 and 2020 (NED objective)

Item	Unit	Swimming			Picnicking			Waterskiing		
		1970	1990	2020	1970	1990	2020	1970	1990	2020
Miss. 2										
Activity occasions	Thousands	132.5	176.6	235.0	51.9	85.9	131.0	13.0	16.4	20.9
Land requirements	Acres	3.2	4.1	5.2	5.0	9.0	13.0	-	-	-
Water requirements	Acres	1.5	2.0	2.7	-	-	-	288.0	364.0	465.
Miss. 5										
Activity occasions	Thousands	313.0	596.0	974.5	298.2	516.7	808.8	48.9	70.9	100.4
Land requirements	Acres	9.7	15.2	22.5	31.0	53.0	83.0	-	-	-
Water requirements	Acres	3.6	6.8	11.1	-	-	-	1,086.0	1,576.0	2,230.0
Miss. 6										
Activity occasions	Thousands	761.3	1,022.5	1,371.8	279.7	481.4	751.0	59.3	79.6	106.8
Land requirements	Acres	18.4	23.5	30.3	29.0	50.0	77.0	-	-	-
Water requirements	Acres	8.7	11.7	15.7	-	-	-	1,317.0	1,769.0	2,374.6
Miss. 8										
Activity occasions	Thousands	111.6	181.1	275.1	95.0	119.8	192.3	(+43.3)	(+37.9)	(+30.5)
Land requirements	Acres	2.5	3.9	5.7	10.0	12.0	20.0	-	-	-
Water requirements	Acres	1.3	2.1	3.2	-	-	-	(+961.0)	(+841.0)	(+679.0)
Miss. totals										
Activity occasions	Thousands	1,318.4	1,976.2	2,856.4	724.8	1,203.8	1,883.1	77.9	129.0	197.6
Land requirements	Acres	33.8	46.7	63.7	75.0	124.0	193.0	-	-	-
Water requirements	Acres	15.1	22.6	32.7	-	-	-	1,730.0	2,868.0	4,390.0
Ala. 1										
Activity occasions	Thousands	189.4	226.9	299.3	5.0	22.0	54.8	8.9	11.9	17.6
Land requirements	Acres	4.3	5.0	6.5	1.0	2.0	5.0	-	-	-
Water requirements	Acres	2.1	2.6	3.4	-	-	-	199.0	264.0	391.0
Ala. 2										
Activity occasions	Thousands	361.4	466.8	668.3	255.5	303.2	394.5	(+8.6)	(+0.3)	15.6
Land requirements	Acres	8.0	10.1	14.0	27.0	31.0	41.0	-	-	-
Water requirements	Acres	4.1	5.4	7.7	-	-	-	(+190.0)	(+6.0)	346.0
Ala. 6										
Activity occasions	Thousands	661.1	789.5	1,039.5	104.4	162.5	275.8	(+35.0)	(+24.9)	(+5.3)
Land requirements	Acres	14.9	17.4	22.3	11.0	17.0	28.0	-	-	-
Water requirements	Acres	7.6	9.1	12.0	-	-	-	(+778.0)	(+554.0)	(+117.0)
Ala. totals										
Activity occasions	Thousands	1,212.0	1,483.2	2,007.1	364.9	487.7	725.1	(+34.7)	(+13.3)	37.9
Land requirements	Acres	27.2	32.5	42.8	39.0	50.0	74.0	-	-	-
Water requirements	Acres	13.8	17.1	23.1	-	-	-	(+769.0)	(+296.0)	852.0
Basin totals										
Activity occasions	Thousands	2,530.3	3,459.4	4,863.5	1,089.7	1,691.5	2,608.2	43.2	115.7	235.5
Land requirements	Acres	61.0	79.2	106.5	114.0	174.0	267.0	-	-	-
Water requirements	Acres	28.9	39.7	55.8	-	-	-	961.0	2,572.0	5,014.

continued --

Table 7.3. Recreation resource component needs[1/] by planning and development districts, Tombigbee River Basin, 1970 and projected 1990 and 2020 (NED objective) (continued)

Item	Unit	Boating			Hiking			Camping		
		1970	1990	2020	1970	1990	2020	1970	1990	2020
Miss. 2										
Activity occasions	Thousands	38.8	54.0	74.2	2.5	3.5	4.8	17.4	23.7	31.4
Land requirements	Acres	-	-	-	27.0	40.0	52.0	9.0	12.0	16.0
Water requirements	Acres	539.0	751.0	1,031.0	-	-	-	-	-	-
Miss. 5										
Activity occasions	Thousands	(+124.0)	(+26.3)	104.5	(+16.9)	(+10.7)	(+2.4)	137.5	177.8	231.8
Land requirements	Acres	-	-	-	(+188.0)	(+120.0)	(+28.0)	67.0	87.0	113.0
Water requirements	Acres	(+1,722.0)	(+365.0)	(+1,451.0)	-	-	-	-	-	-
Miss. 6										
Activity occasions	Thousands	(+166.8)	(+59.4)	84.2	(+61.2)	(+55.5)	(+47.9)	(+238.7)	(+201.5)	(+151.7)
Land requirements	Acres	-	-	-	(+683.0)	(+620.0)	(+535.0)	(+117.0)	(+98.0)	(+74.0)
Water requirements	Acres	(+2,317.0)	(+825.0)	1,170.0	-	-	-	-	-	-
Miss. 8										
Activity occasions	Thousands	15.1	39.2	71.6	(+1.6)	(+0.1)	1.9	31.3	41.2	54.6
Land requirements	Acres	-	-	-	(+18.0)	(+1.0)	22.0	15.0	20.0	27.0
Water requirements	Acres	210.0	544.0	995.0	-	-	-	-	-	-
Miss. totals										
Activity occasions	Thousands	(+236.9)	7.5	334.5	(+77.2)	(+62.8)	(+43.6)	(+52.5)	41.2	166.1
Land requirements	Acres	-	-	-	(+862.0)	(+701.0)	(+489.0)	(+26.0)	21.0	82.0
Water requirements	Acres	(+3,290.0)	105.0	4,647.0	-	-	-	-	-	-
Ala. 1										
Activity occasions	Thousands	(+44.8)	(+34.6)	(+15.0)	(+89.7)	(+88.8)	(+87.1)	32.3	37.9	48.6
Land requirements	Acres	-	-	-	(+1,000.0)	(+990.0)	(+972.5)	16.0	19.0	24.0
Water requirements	Acres	(+662.0)	(+481.0)	(+209.0)	-	-	-	-	-	-
Ala. 2										
Activity occasions	Thousands	(+287.2)	(+258.7)	(+204.1)	12.5	15.0	19.9	56.9	72.6	102.5
Land requirements	Acres	-	-	-	137.5	167.5	222.5	27.0	35.0	50.0
Water requirements	Acres	(+3,989.0)	(+3,593.0)	(+2,835.0)	-	-	-	-	-	-
Ala. 6										
Activity occasions	Thousands	(+1,360.1)	(+1,325.4)	(+1,257.7)	(+788.3)	(+785.3)	(+779.3)	92.9	111.9	149.1
Land requirements	Acres	-	-	-	(+8,797.5)	(+8,765.0)	(+8,697.5)	45.0	54.0	73.0
Water requirements	Acres	(+18,891.0)	(+18,408.0)	(+17,468.0)	-	-	-	-	-	-
Ala. totals										
Activity occasions	Thousands	(+1,692.1)	(+1,618.7)	(+1,476.8)	(+865.5)	(+859.1)	(+846.5)	182.1	222.4	300.2
Land requirements	Acres	-	-	-	(+9,660.0)	(+9,587.5)	(+9,447.5)	88.0	108.0	147.0
Water requirements	Acres	(+23,502.0)	(+22,482.0)	(+20,512.0)	-	-	-	-	-	-
Basin totals										
Activity occasions	Thousands	(+1,929.0)	(+1,611.2)	(+1,142.3)	(+942.7)	(+921.9)	(+890.1)	129.6	263.6	466.3
Land requirements	Acres	-	-	-	(+10,522.0)	(+10,289.0)	(+9,937.0)	62.0	129.0	229.0
Water requirements	Acres	(+26,792.0)	(+22,377.0)	(+15,865.0)	-	-	-	-	-	-

Source: Adapted from Alabama and Mississippi Statewide Comprehensive Outdoor Recreation Plans.

1/ Plus (+) designates a surplus, supply exceeds demands.

Table 7.4. National economic development objective component needs, Tombigbee River Basin, 1970 and projected 1990 and 2020

Component need	Unit	Year		
		1970	1990	2020
		Thou.	Thou.	Thou.
Flood damage reduction	Acres	690.6	690.6	690.6
	Dollars	7,873.7	10,235.7	14,960.1
Wetness hazard damage reduction				
Cropland	Acres	502.1	553.3	586.8
Pastureland	Acres	424.4	418.3	360.8
Erosion damage reduction				
Critical areas				
Cropland	Acres	94.7	76.0	66.5
Pastureland	Acres	113.8	111.8	111.8
Forestland	Acres	77.5	77.5	77.5
Gully	Acres	31.1	27.9	27.9
Streambank	Miles 3/	763.0	763.0	763.0
Strip mine	Acres	18.8	18.8	18.8
Management systems				
Other areas				
Cropland	Acres	373.1	401.1	426.6
Pastureland	Acres	453.8	415.9	372.3
Forestland	Acres	2,308.4	2,268.2	2,268.2
Land 1/				
Cropland	Acres	1,272.9	1,272.7	1,330.5
Pastureland	Acres	1,278.4	1,321.3	1,220.2
Forestland	Acres	5,785.3	5,665.0	5,635.0
Recreation				
Swimming beaches 2/	Activity occasions	1,062.9	1,380.0	1,855.6
Picnicking	Activity occasions	1,089.7	1,691.5	2,608.2
Camping	Activity occasions	338.3	465.1	618.0
Hunting	Man-days	0.0	0.0	391.5

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Land needs shown are based on NED land use.

2/ Meets approximately 40 percent of total swimming activity occasions; swimming pools meet other needed occasions.

3/ Miles, not in thousands.

needs only represent resident licensed sportsmen, the resource is adequate to withstand considerable out-of-basin pressure as well as non-licensed pressure.

Summary - NED

Component needs for the national economic development objective are summarized in table 7.4. All items are related to the study concerns identified in Chapter III and translated into specific components of the NED objective.

Component Needs - EQ

This objective reflects society's concern and emphasis for the natural environment and its maintenance and enhancement as a source of present enjoyment and a heritage for future generations. Environmental needs reflect current preferences and preferences expected to prevail in the future.

Erosion Damage Reduction

Erosion affects the quality of the land thereby causing a reduction in aesthetic and other values. All erosion to some degree reduces the environmental quality of the basin. Also, the resulting sediment does additional damage. Some of the common damages occur to waterways, reservoirs, and residences, among others.

Environmental quality component needs associated with specific sources of erosion were established for gullies, strip mines, roadsides, and streambanks. Present and projected component needs are the same as presented in table 6.5 for each sub-basin. The magnitude of erosion problems in future years is as follows: gullies, 27.9 thousand acres in 1990 and 2020; strip mines, 18.8 thousand acres in 1990 and 2020; roadbanks, 10.8 thousand acres in 1990 and 2020; and streambanks, 763 miles in 1990 and 2020 (table 7.7).

Sediment Yield Reduction

Basin watersheds were investigated and total sediment yields were computed for each watershed. Potentials for reducing sediment yields were established by computing yields in each watershed with various degrees of application of land treatment and critical area stabilization measures in conjunction with some control by a structural measure program. Component needs for sediment yield reduction are as shown in table 6.6 for each sub-basin. The basin summary is shown in table 7.7.

Agricultural Pollutants

The USDA procedures for planning water and related land resources point out that it is not practical to specifically identify all possible component and associated needs of the environmental quality objective--given its broad and pervasive nature. It is recognized that the production and processing of agricultural and forest products affect the quality of the environment to a very significant degree and in many complex ways. Conversely, many changes in the environment profoundly affect agriculture and forestry. However, research in many instances has not progressed sufficiently to enable individuals to understand, predict, and control these complicated interrelationships.

Selected agricultural pollution problems are discussed in Chapter III--namely, insecticides, plant nutrients, animal wastes, and sediment. Sediment is addressed separately from the other agricultural pollutants. In terms of volume, sediment is the greatest pollutant of the basin. In addition, it is the carrier of other possible pollutants such as insecticides, plant nutrients, and other chemicals, or it may be the scavenger of these and other pollutants. Component needs were previously established for sediment.

Environmental quality component needs were not established for insecticides and plant nutrients. Data necessary to establish needs were considered inadequate or the problems were regarded as insignificant based on the problem analysis presented in Chapter III. In general, where best management systems for land use are installed, the problems are minimized.

Component needs for animal waste, expressed in waste treatment units, are presented in table 7.5. Waste treatment units are projected to increase from 393 in 1970, to 552 in 1990, and to 594 in 2020.

Environmental Features

Inventories were made of the scenic, historic, archaeological, and ecological sites. Information about these sites left much to be desired. However, available data revealed that many sites need protecting to insure their future value.

Component needs for the preservation of these sites are presented in table 7.6. Scenic sites that need preservation total 57 in 1990 and 64 in 2020; historic sites total 31 in 1990 and 36 in 2020; archaeological sites total 452 in 1990 and 484 in 2020; and ecological sites, 6 in 1990 and 6 in 2020.

Table 7.5. Animal waste pollution reduction component needs, by sub-basin, Tombigbee River Basin, 1970 and projected 1990 and 2020

(EQ Objective)

Sub-basin	Animal waste treatment units		
	1970	1990	2020
	Number	Number	Number
34 Upper	110	155	166
34 Lower	53	74	80
34a	50	71	75
34b	22	30	33
34c	22	30	33
34d	59	83	90
34e	18	26	28
34f	47	66	71
34h	12	17	18
Basin	393	552	594

Source: Soil Conservation Service, United States Department of Agriculture.

Table 7.6. Component needs for preservation of scenic, historic, archaeological, and ecological sites, Tombigbee River Basin, 1970 and projected 1990 and 2020

Basin portion in state and year	Scenic	Historic	Archaeological	Ecological
	Sites	Sites	Sites	Sites
Mississippi				
1970	28	89	368	1
1990	34	11	398	3
2020	40	13	428	3
Alabama				
1970	22	164	51	1
1990	23	20	54	3
2020	24	23	56	3
Basin				
1970	50	253	419	2
1990	57	31	452	6
2020	64	36	484	6

Source: Soil Conservation Service, United States Department of Agriculture.

Summary - EQ

Component needs for the environmental quality objective are summarized in table 7.7. All items are related to the study concerns identified in Chapter III and translated into specific components of the EQ objective.

Table 7.7. Environmental quality objective component needs, Tombigbee River Basin, 1970 and projected 1990 and 2020

Component need	Unit	Year		
		1970	1990	2020
Erosion damage reduction				
Gully	Thousand acres	31.1	27.9	27.9
Strip mine	Thousand acres	18.8	18.8	18.8
Streambank	Miles	763.0	763.0	763.0
Roadside	Thousand acres	12.2	10.8	10.8
Sediment yield reduction from sub-basins	Thousand tons	14,293.0	13,266.0	13,562.0
Animal waste treatment units	Number	393	552	594
Preserve environmental elements				
Natural and scenic areas	Number	50	57	64
Ecological areas	Number	2	6	6
Archaeological sites	Number	419	452	484
Historical sites	Number	253	31	36

Source: River Basin Survey Staff, United States Department of Agriculture.

CHAPTER VIII

ALTERNATIVE PLANS

General

The study concerns as identified in Chapter III for each of the objectives provide the basis for alternative plans. Specific components for both the NED objective and EQ objective were identified from the study concerns. The sponsors provided input for the study concerns and approved the specific components of the objectives. The kinds of outputs desired as a result of the study are presented in Chapter III.

The study generally follows the USDA procedures for planning water and related land resources. However, the transition from past study procedures to current procedures created some study problems. These problems related primarily to the details of the inventories and to inventories concerning environmental factors that required more emphasis using the new procedures. Some inventories and the resulting component needs were not at the level of detail desired. Many alternative means of providing solutions to problems were not investigated. Also, time became a factor as extension of the study was not forthcoming.

Emphasis was placed on major problems, as the study emphasizes problem solving. Land use to meet the demands for crop and pasture products and other competitive demands was developed. In all cases forestland acreage was that land left after demands for higher uses were met. Emphasis was also placed on identifying upstream watersheds that have a potential for reducing flood damages and for identifying, by sub-basins, the treatment needs to protect the land resource from erosion hazards and the resulting damages caused by sediment. A basinwide erosion and sediment control program needs implementing. Also, recreation needs and sites were identified for each planning and development district. Specific locations for individual sites were not identified. Evaluations were also made that concern the preservation of scenic areas, ecological communities, archaeological sites, and historical sites.

Number, Type, and Nature of Alternatives

Projections are a manifestation of the study concerns of basin residents and sponsors of the study. Component needs for the NED and EQ objectives focus on the outputs expected from the plan or plans formulated. Each plan formulated provides plan elements that meet all or part of the component needs. The effectiveness of each alternative plan is measured by how many needs are met.

Three alternative plans were formulated--NED, EQ, and A. The NED total plan (early action and long range plans) optimizes the national economic development objective; the EQ plan emphasizes the environmental quality objective; and the A plan provides for elements from both objectives and also for less flood damage reduction than the NED plan as the result of reduced channel modification.

An analysis of the component needs revealed that some of them, while not listed under both objectives, were essentially in harmony with both objectives. These needs, mainly concerned with erosion damage reduction and recreation, are essentially the same in all plans. Differences in the plans are in the flood damage reduction plan elements, land treatment where wetness is a hazard, animal waste treatment, and in preservation of environmental features such as scenic sites, ecological communities, archaeological sites, and historic sites.

NED Plan

General

This plan optimizes the NED objective. Efficiency in all operations and in furnishing facilities is of primary concern. The specific components of this objective are (1) increased or more efficient output of food and fiber, and (2) increased or more efficient output of recreational services. The plan gives ample consideration to quality of the basin water and related land resources by insuring that the quality of the resource base is protected, the quality of the environment is improved, and the quality of the standard of living is improved.

Land Use

Land use data for the NED plan are presented in table 8.1. The aggregate acreage for any of the major land use categories reflect only minor changes during the period 1970 to 2020. However, the component uses of cropland and pastureland reflect greater changes--absolute and percentagewise. Inherent in the data are the assumptions regarding their derivation. Land use for the NED plan is based on the following assumptions:

1. The land to be used for future production of crop and pasture products is restricted to the current cropland and pastureland base to the extent possible.

2. Row and close seeded crops will be produced only on Classes I, II, III, and IV land.

3. Crop production costs include a cost for installing and maintaining land treatment practices.

Table 8.1. Land use for the NED plan, Tombigbee River Basin, 1970 and projected 1990 and 2020

Major use	1970	1990	2020
	1,000 acres	1,000 acres	1,000 acres
Cropland			
Harvested	936.8	949.0	1,127.9
Pastured	46.8	95.0	112.8
Idle	289.3	228.7	89.8
Total	1,272.9	1,272.7	1,330.5
Pastureland			
Improved	494.9	492.6	1,096.5
Unimproved	783.5	828.7	123.7
Total	1,278.4	1,321.3	1,220.2
Forestland 1/	5,785.3	5,665.0	5,635.0
Other uses 2/	466.5	544.1	617.4
Total	8,803.1	8,803.1	8,803.1

Source: Formulated by River Basin Survey Staff, United States Department of Agriculture.

1/ Includes all federal land.
2/ Includes all other land and water areas.

4. Total acres needed to produce crop and pasture products include acres necessary to install conservation management systems.

5. Land conversions and management systems result in increased yields. In the years 1990 and 2020, NED plan yields exceed the without project yields by 22 percent and 29 percent, respectively.

6. Forest acreage is the residual after higher priority needs are met.

Agricultural and Forestry Production

Projected agricultural production for the six major crops included in the linear programming analysis are shown in table 8.2.

Table 8.2. Projected agricultural production for the NED plan, Tombigbee River Basin, 1990 and 2020

Crop	Unit	1990	2020
		1,000	1,000
Cotton	Bales	44.8	71.2
Soybeans	Bushels	18,447.3	31,019.1
Corn	Bushels	3,384.3	8,206.5
Wheat	Bushels	743.3	6,246.0
Hay	Tons	432.9	65.2
Pasture	AUM	3,390.6	8,750.5

Source: Economic Research Service and Soil Conservation Service, United States Department of Agriculture.

Forest acreage is projected to decline 120.3 thousand acres during the period 1970 to 1990 and 30.0 thousand acres during the period 1990 to 2020. The projected acreage will meet the demand for 336 million cubic feet of roundwood in 1990 and 500 million cubic feet in 2020. However, the capability of the forestland base to supply more roundwood will require better management to accelerate growth and practices to increase timber utilization.

The present trends of management will result in an annual deficit of 59.3 million cubic feet of roundwood in 2020. This deficit can be overcome with accelerated management and better utilization. This will require tree planting and timberstand improvement--management systems--to increase the supply by 43.3 million cubic feet by 2020 (table 8.3). The remaining 16.0 million cubic feet will be met by a 30 percent increase in roundwood utilization both in woods operations and manufacturing processes.

Components and Plan Elements

Components and plan elements for the NED plan are presented in table 8.3. The components are flood damage reduction, wetness hazard damage reduction, erosion damage reduction, management systems, and recreation. Plan elements to meet some of the component needs are also identified along with early action and long range quantities.[1/]

1/ Early action refers to the year 1990 and long range refers to the year 2020--applicable to all alternative plans. Hereafter, 1990 is synonymous with early action and 2020 is synonymous with long range.

Table 8.3. NED alternative plan, Tombigbee River Basin, 1990 and 2020

Components and plan elements	Unit	Plan element quantities	
		1990	2020
Flood Damage Reduction			
Floodwater retarding structure	Number1/	336	469
Channel modification	Miles2/	1,473	2,242
Wetness Hazard Damage Reduction			
Cropland and pastureland			
Cropping management system	Acres	442,631	469,431
Pasture management system	Acres	334,673	288,673
Erosion Damage Reduction - Critical Area			
Gully stabilization			
Critical area planting	Acres	25,103	25,103
Strip mine stabilization			
Critical area planting	Acres	16,911	16,911
Streambank stabilization			
Vegetation and structural measures	Miles	609	609
Cropland, pastureland, and forestland stabilization			
Critical area planting	Acres	184,517	175,998
Land use conversion - cropland and pastureland to timberland	Acres	64,001	62,298
Land use conversion - cropland to pastureland	Acres	54,685	47,869
Pasture management system	Acres	105,014	98,198
Woodland management system	Acres	46,504	46,504
Management Systems - Other Areas			
Cropland, pastureland and forestland			
Cropping management system	Acres	320,878	341,278
Pasture management system	Acres	332,723	297,843
Woodland management system	Acres	1,814,585	1,814,585
Recreation			
Swimming beach sites	Number	80	107
Picnicking area sites	Number	87	134
Camping area sites	Number	45	61
Improved wildlife populations	Acres	0	400,000

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Alabama - FWRS's: 1990 - 111; 2020 - 203.
2/ Alabama - Channels: 1990 - 648; 2020 - 1,183.

Flood damage reduction plan elements include floodwater retarding structures and channel modifications. The 336 floodwater retarding structures and the 1,473 miles of channel modifications included in the early action plan provide for flood damage reduction in 23 watersheds identified in Chapter VII (map 7.1). By the year 2020, flood damage reduction is planned for in 10 additional watersheds.

All land treatment plan elements, as quantified, apply to the entire basin for this alternative plan and other alternative plans. Problems exist throughout the basin. Therefore, for effective reduction in erosion damages and sediment yields it is necessary to treat the entire basin.

The land treatment plan elements provide for damage reduction on cropland and pastureland where wetness is a hazard. The early action plan provides for treatment on 442.6 thousand acres of cropland and 334.7 thousand acres of pastureland (table 8.3).

Additional land treatment plan elements to reduce erosion damages are also listed in table 8.3. The early action plan treatment measures will stabilize 25.1 thousand acres of gullies, 16.9 thousand acres of strip mines, and 609 miles of streambanks. Further, the early action plan provides measures to treat 231.1 thousand acres of critical area; cropland, 68.4 thousand acres; pastureland, 100.7 thousand acres; and forestland, 62.0 thousand acres.

Also, early action plan elements provide treatment on 320.9 thousand acres of cropland, 332.7 thousand acres of pastureland, and 1,814.6 thousand acres of forestland for a total of 2.5 million acres. These management systems improve yields as well as reduce erosion.

The early action plan provides for recreation sites to meet the needs of the basin. Table 8.3 lists the number of sites for the early action and long range plans for swimming beaches, picnicking, camping, and acres of land that will be improved for wildlife. These measures are for the entire basin. The standards for each type of site are discussed in Chapter IX.

Costs and Benefits

Structures, measures, and facilities proposed for installation by the year 2020 are estimated to cost $271.4 million (table 8.4). Flood damage reduction plan elements total $129.9 million, land treatment plan elements total $127.3 million, and recreation plan elements total $14.2 million.

The early action plan average annual costs are $31.9 million, including costs for land treatment measures. Average annual benefits, excluding those from land treatment measures, total $7.3 million for flood damage reduction and $4.6 million for recreation sites.

Table 8.4. NED alternative plan costs and benefits, Tombigbee River Basin, 1990 and 2020

Components and elements	Total plan			Early action plan	
	Total installation cost	Average annual			
		Cost	Benefits	Cost	Benefits
	Thousand dollars				
Flood damage reduction plan elements	129,902.0	8,674.7	9,655.9	6,090.2	7,257.2
Wetness hazard damage reduction plan elements	22,575.7	8,088.7	1/	7,786.1	1/
Erosion damage reduction critical area plan elements	28,761.7	4,642.4	1/	4,642.4	1/
Management systems other area plan elements	75,966.1	12,014.1	1/	11,824.9	1/
Recreation					
Swimming beaches	1,605.0				
Picnicking area sites	4,020.0				
Camping area sites	4,575.0				
Total	10,200.0	2/ 2,156.3	2/ 6,559.0	2/ 1,519.0	2/ 4,570.0
Improved wildlife population	4,000.0	1,845.6	2,400.0	0	0
Total	271,405.5	37,421.8	XX	31,862.6	XX

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Not evaluated.
2/ Average annual cost and benefits for swimming, picnicking, and camping.

Effectiveness to Meet Component Needs

The worth of any alternative plan may be evaluated by how the plan meets the component needs. Table 8.12 lists all of the basin's component needs for the NED and EQ objectives. Each plan is tested against these quantified needs by listing the quantities provided and those remaining.

The NED plan provides for 57 percent of the flood damage reduction component need. The plan meets about 80 percent of the land treatment needs except for roadside erosion. Land needs for cropland, pastureland, and forestland are met. Also the plan is nearly 100 percent effective in meeting the recreation needs. Sediment yields from sub-basins are reduced 39 percent.

The plan does not provide for animal waste treatment units to reduce pollution. Also, no environmental plan elements are provided.

Plan Effects Displays

The beneficial and adverse effects of the NED early action plan are displayed in four accounts.1/ Display 8.1--the national economic development account--lists the total average annual beneficial effects as $9.8 million and the adverse effects as $7.6 million. Net beneficial effects total $2.2 million annually.

Display 8.2--the environmental quality account--reveals how the NED alternative affects: areas of natural beauty; the quality of water, land, and air; biological resources and selected ecosystems; and the commitment of resources.

Display 8.3--the regional development account--provides the beneficial and adverse effects of the early action plan to Alabama and Mississippi and to the rest of the nation. The beneficial and adverse effects on income and employment are displayed.

Display 8.4--the social well-being account--presents the beneficial and adverse effects relating to: real income distribution; life, health, and safety; and recreational opportunities.

1/ National Economic Development Account, Environmental Quality Account, Regional Development Account, and Social Well-Being Account.

DISPLAY 8.1

NED ALTERNATIVE EARLY ACTION PLAN, 1990

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measure of effects (Average annual)1/2/
Beneficial effects:	Thousand dollars
A. The value to users of increased outputs of goods and services.	
1. Flood prevention	5,461.2
2. Recreation	3,539.7
3. Utilization of unemployed and underemployed labor resources	
a. Project construction	762.2
Total beneficial effects	9,763.1
Adverse effects:	
A. The value of resources required for a plan.	
1. Floodwater retarding structures and recreation facilities	
a. Project installation	6,062.6
b. OM&R	1,546.6
Total adverse effects	7,609.2
Net beneficial effects	2,153.9

Source: River Basin Staff, United States Department of Agriculture.

1/ 100 years at 6 1/8 percent interest.

2/ Land treatment effects were not evaluated. Land treatment installation costs total $126.0 million with an annual cost of $24.3 million.

DISPLAY 8.2

NED ALTERNATIVE EARLY ACTION PLAN, 1990

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Effects
Beneficial and adverse effects:	
A. Areas of natural beauty.	1. Improve the aesthetic quality by flood prevention of 395,300 acres. 2. Loss of 20,050 acres of bottomland hardwoods along planned channel alterations. 3. Create 16,590 acres of primarily large water impoundments. 4. Inundate 6,375 acres of forestland and stream bottoms. 5. Disruption of streamside vegetation along 1,473 miles of stream to be altered. 6. Permanent loss of 1,745 acres of vegetation to channels. 7. Reduce erosion on 2,741,300 acres. 8. Improve the aesthetic quality of streams by 609 miles of streambank stabilization.
B. Quality considerations of water, land, and air.	1. Storage of 105,000 acre-feet of sediment behind dams. 2. Reduce sediment yield from sub-basins by 4,874,000 tons. 3. Temporary disruption of streamside vegetation on 1,473 miles of channels to be altered. 4. Reduce erosion on 2,741,300 acres. 5. Improve quality of lands and waters by flood damage reduction on 395,300 acres. 6. Improve water and land resource by stabilization of 609 miles of streambanks. 7. Creation of 16,590 acres of water in place of forest, pasture, and cropland.

Components	Measures of Effects
Beneficial and adverse effects:	
C. Biological resources and selected ecosystems.	1. Create 16,590 acres of flatwater fish habitat. 2. Provide 16,590 acres of resting area for migratory waterfowl. 3. Inundate 6,375 acres of good wildlife habitat - 4,635 acres of bottomland hardwoods; 1,740 acres of upland timberland. 4. Improve wildlife habitat by providing watering places and additional edge cover at 336 floodwater retarding structures. 5. Restricted wildlife habitat on 6,210 acres of bottomland hardwoods and 7,535 acres of upland timberland in floodpools. 6. Reduce quality of wildlife habitat on 20,050 acres of bottomland hardwoods along planned channel alterations. 7. Reduced overwintering waterfowl habitat on 395,300 acres now protected from flooding.
D. Irreversible and irretrievable commitments of resources.	1. Conversion of 4,635 acres of bottomland hardwoods, 1,740 acres of upland timberland and 10,215 acres of cropland and pasture into reservoir pools. 2. Loss of 1,745 acres of land to channels. 3. Use of construction materials and other resources for plan elements

Source: River Basin Survey Staff, United States Department of Agriculture.

DISPLAY 8.3

NED ALTERNATIVE EARLY ACTION PLAN, 1990

REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of Effects: Alabama and Mississippi (Average Annual)	Measures of Effects: Rest of Nation 1/ 2/
Income:		
Beneficial effects:	Thousand dollars	
A. The value of increased output of goods and services to users residing in the basin.		
1. Flood prevention	5,461.2	0.0
2. Recreation	3,539.7	0.0
3. Utilization of unemployed and underemployed labor resources		
a. Project construction	762.2	0.0
4. Additional wages and salaries accruing to the basin from implementation of the plan		
a. Project OM&R (structures)	25.3	- 25.3
b. Recreation service sector	233.6	-233.6
B. The net value of output to users residing in the basin from external economies.		
1. Net indirect activities associated with increased net returns from flood prevention and recreation	1,790.7	0.0
2. Net indirect and induced activities associated with utilization of regional unemployed and underemployed and other labor resources		
a. Farm hired labor	250.0	-250.0
b. Recreation service sector	46.7	- 46.7
c. Project OM&R	17.0	- 17.0
Total beneficial effects	12,126.4	-572.6

Components	Measures of Effects: Alabama and Mississippi (Average Annual)	Measures of Effects: Rest of Nation 1/ 2/
Income:		
Adverse effects:	Thousand dollars	
A. The value of resources contributed from within the basin to achieve the outputs.		
1. Floodwater retarding structures and recreation activities		
a. Project installation	1,697.5	4,365.1
b. OM&R	1,546.6	0.0
Total adverse effects	3,244.1	4,365.1
Net beneficial effects	8,882.3	-4,937.7

1/ 100 years @ 6 1/8 percent interest.

2/ Land treatment, animal waste, and preservation of environmental elements effects were not evaluated.

Components	Measures of Effects: Alabama and Mississippi	Measures of Effects: Rest of Nation
Employment:		
Beneficial effects:		
A. Increase in the number and types of jobs.		
1. Agricultural employment	Create 1,966 permanent jobs in agricultural production	-
2. Employment in recreation	Create 531 permanent semi-skilled jobs in recreation	-
3. Employment for project construction	Create 1,922 man-years of labor for one year	-
4. Employment for project OM&R	Create 99 permanent semi-skilled jobs	-
5. Indirect and induced employment for project installation and output of project goods and services	Create 268 permanent semi-skilled jobs	-
Total beneficial effects	Create 2,864 permanent semi-skilled jobs Create 1,922 man-years of labor in construction	-

Components	Measures of Effects: Alabama and Mississippi	Measures of Effects: Rest of Nation
Employment:		
Adverse effects:		
A. Decrease in number and types of jobs.		
1. Lost in agricultural employment of project take area	177 permanent semi-skilled jobs in agricultural employment	-
2. Lost in indirect and induced employment associated with project take area	36 permanent semi-skilled jobs	-
Total adverse effects	Lose 213 permanent semi-skilled jobs	-
Net beneficial effects	Create 2,651 permanent semi-skilled jobs Create 1,922 man-years of labor in construction	- -

Source: River Basin Staff, United States Department of Agriculture.

DISPLAY 8.4

NED ALTERNATIVE EARLY ACTION PLAN, 1990

SOCIAL WELL-BEING ACCOUNT

Components	Measures of effects
Beneficial and adverse effects:	
A. Real income distribution	1. Create 2,864 low to medium income permanent jobs for area residents.
	2. The net monetary benefit of $12,126,400 will provide opportunity to improve the income of about 28 percent of the families in the basin where incomes are below the poverty level.
B. Life, health, and safety.	1. Increased output will be in soybeans, wheat, and livestock products.
	2. Reduce flood damages on 395.3 thousand acres.
C. Recreational opportunities.	1. Create 2.4 million recreation days primarily for a rural farm population.

Source: River Basin Staff, United States Department of Agriculture.

EQ Plan

General

This plan emphasizes the environmental quality objective. The objective reflects society's concern and emphasis for the natural environment and its maintenance and enhancement as a source of present enjoyment and a heritage for future generations. The specific components of the objective are (1) to preserve natural aesthetic and scenic features, (2) to improve the quality of water and land, (3) to improve biological resources and ecosystems, and (4) to preserve archaeological and historical values. Also, the plan provides for some national economic development objective component needs where these needs do not conflict with the environmental quality component needs.

Land Use

Land use data for the EQ plan are presented in table 8.5. The data for 1990 and 2020 reflect a decrease in cropland and forestland, and an increase in pastureland and other. Inherent in the data are the assumptions regarding their derivation. Land use for the EQ plan is based on the following assumptions:

1. The land needed for future production of crop and pasture products is restricted to the current cropland and pastureland base to the extent possible.

2. Row and close seeded crops will be produced only on Classes I, II, III, and IV land.

3. Crop production costs include a cost for installing and maintaining land treatment practices.

4. Total acres needed to produce crop and pasture products include acres necessary to install conservation management systems.

5. In the years 1990 and 2020, EQ plan yields exceed the without project yields by 9 percent and 14 percent, respectively.

6. Forest acreage is the residual after higher priority needs are met.

Agricultural and Forestry Production

The environmental quality plan, developed using the linear programming model and the assumptions listed previously, provides for a mix of agricultural products different from those in the NED plan. The EQ projections for the six major crops are presented in table 8.6.

Table 8.5. Land use for the EQ plan, Tombigbee River Basin, 1970 and projected 1990 and 2020

Major use	1970	1990	2020
	1,000 acres	1,000 acres	1,000 acres
Cropland			
Harvested	936.8	890.2	879.0
Pastured	46.8	44.1	40.0
Idle	289.3	224.6	116.3
Total	1,272.9	1,158.9	1,035.3
Pastureland			
Improved	494.9	596.9	700.0
Unimproved	783.5	838.2	815.8
Total	1,278.4	1,435.1	1,515.8
Forestland 1/	5,785.3	5,665.0	5,634.6
Other uses 2/	466.5	544.1	617.4
Total	8,803.1	8,803.1	8,803.1

Source: Formulated by River Basin Survey Staff, United States Department of Agriculture.

1/ Includes all federal land.
2/ Includes all other land and water areas.

Table 8.6. Projected agricultural production for the EQ plan, Tombigbee River Basin, 1990 and 2020

Crop	Unit	1990	2020
		1,000	1,000
Cotton	Bales	62.1	29.3
Soybeans	Bushels	15,560.4	27,955.6
Corn	Bushels	4,251.2	5,083.1
Wheat	Bushels	998.7	231.8
Hay	Tons	447.8	234.2
Pasture	AUM	3,906.2	9,738.7

Source: Economic Research Service and Soil Conservation Service, United States Department of Agriculture.

The forestland acres in the EQ plan are identical to the NED plan in 1990 and differ by only 400 acres in 2020. Thus the supply of roundwood is considered the same as in the NED plan. The acreage in 1990 will supply the demand for 336 million cubic feet of roundwood in 1990 and 500 million cubic feet in 2020. The supply in each projected year is equal to or greater than the demand. However, to meet these demands, better management to accelerate growth and practices to increase better utilization of roundwood will be required. This was discussed previously under the NED alternative.

Components and Plan Elements

Components and plan elements for the EQ plan are presented in table 8.7. The components are flood damage reduction, wetness hazard damage reduction, erosion damage reduction, management systems, animal waste treatment, preservation of scenic areas, ecological communities, archaeological sites and historic sites, and recreation. Plan elements are identified under the components and are quantified for the early action and long range plans.

Flood damage reduction plan elements include 262 floodwater retarding structures in 23 watersheds by 1990. An additional 102 floodwater retarding structures in 10 other watersheds are proposed by the year 2020. Thus, the total plan provides for 364 floodwater retarding structures in 33 watersheds. These plan elements provide less flood damage reduction than the NED plan elements.

The land treatment plan elements provide for damage reduction on cropland and pastureland where wetness is a hazard. The early action plan provides for management systems to provide treatment on 221.3 thousand acres of cropland and 167.3 thousand acres of pastureland (table 8.7).

Land treatment plan elements to reduce erosion damages are also listed in table 8.7. The early action plan treatment measures will stabilize 25.1 thousand acres of gullies, 16.9 thousand acres of strip mines, 9.7 thousand acres of roadbanks, and 609 miles of streambanks. Further, the early action plan provides measures to treat 231.1 thousand acres of critical area; cropland, 68.4 thousand acres; pastureland, 100.7 thousand acres; and forestland, 62.0 thousand acres. Also, early action plan elements provide management systems to provide treatment on 263.9 thousand acres of cropland, 400.5 thousand acres of pastureland, and 1,814.6 thousand acres of forestland for a total of 2.5 million acres.

In 1990, the EQ plan provides for 552 animal waste treatment units to reduce pollution. Also, plan elements to preserve scenic sites, ecological communities, archaeological sites, and historic sites are provided. They include non-disturbance, land acquisition, or land use restrictions.

Table 8.7. EQ alternative plan, Tombigbee River Basin, 1990 and 2020

Components and plan elements	Unit	Plan element quantities 1990	2020
Flood Damage Reduction			
Floodwater retarding structures	Number	1/ 262	2/ 364
Wetness Hazard Damage Reduction			
Cropland and pastureland			
Cropping management system	Acres	221,316	234,716
Pasture management system	Acres	167,336	144,336
Erosion Damage Reduction - Critical Area			
Gully stabilization			
Critical area planting	Acres	25,103	25,103
Strip mine stabilization			
Critical area planting	Acres	16,911	16,911
Streambank stabilization			
Vegetation and structural measures	Miles	609	609
Roadside vegetative cover	Acres	9,738	9,738
Cropland, pastureland and forestland stabilization			
Critical area planting	Acres	184,517	175,998
Land use conversion - cropland and pastureland to forestland	Acres	64,001	62,298
Land use conversion - cropland to pastureland	Acres	54,685	47,869
Pasture management system	Acres	105,014	98,198
Woodland management system	Acres	46,504	46,504
Management Systems - Other Areas			
Cropland, pastureland and forestland			
Cropping management system	Acres	263,878	222,478
Pasture management system	Acres	400,523	446,343
Woodland management system	Acres	1,814,585	1,814,585
Animal Waste Treatment			
Animal waste treatment units	Number	552	594
Preservation of Scenic Areas			
Non-disturbance	Number	15	25
Land acquisition	Acres	3,000	6,000
Land use restrictions	Acres	8,000	14,000
Preservation of Ecological Communities			
Land acquisition	Acres	500	1,000
Non-disturbance	Number	5	4
Preservation of Archaeological Sites			
National Register classification	Number	30	55
Land acquisition	Acres	300	600
Non-disturbance	Number	380	365
Preservation of Historic Sites			
National Register classification	Number	10	15
Land acquisition	Acres	10	17
Non-disturbance	Number	11	4
Recreation			
Swimming beach sites	Number	80	107
Picnicking area sites	Number	87	134
Camping area sites	Number	45	61
Improved wildlife populations	Acres	0	400,000

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Alabama - 1990: 82 FWRS
2/ Alabama - 2020: 155 FWRS

The EQ plan also provides for recreation sites to meet the needs of the basin. Table 8.7 lists these sites for both the early action and long range plans for swimming beaches, picnic sites, camping sites, and acres of land that will be improved for wildlife.

Costs and Benefits

Structures, measures, and facilities proposed for installation by the year 2020 are estimated to cost $223.3 million (table 8.8). Flood damage reduction plan elements total $66.5 million; land treatment plan elements total $121.1 million; and recreation plan elements total $14.2 million; animal waste treatment units total $3.0 million; and preservation of environmental elements total $18.5 million.

The early action plan average annual costs are $26.5 million. Average annual benefits for flood damage reduction total $2.6 million. Recreation facilities for the early action plan provide $4.6 million annual benefits. Annual benefits were not evaluated for other plan elements.

Effectiveness to Meet Component Needs

The environmental quality alternative plan meets some component needs for the NED and EQ objectives. Table 8.12 lists all of the basin's component needs for the early action and long term time frames. The plan elements provided by the EQ alternative plan are listed for each time frame along with the remaining needs, if unmet.

The EQ plan provides for 20 percent of the flood damage reduction component need and 40 percent of the wetness hazard damage reduction. The plan provides for about 80 percent of the component needs for land treatment and management systems. Almost 100 percent of the recreation needs are met. Sediment yield component needs from sub-basins are reduced 38 percent. The plan is 100 percent effective in meeting the animal waste treatment needs and about 100 percent effective in preserving environmental elements as identified in table 8.12.

Plan Effects Displays

The beneficial and adverse effects of the EQ early action plan are displayed in four accounts. Display 8.5--the national economic development account--lists the total average annual beneficial effects as $5.9 million and the adverse effects as $4.5 million. Net beneficial effects total $1.4 million annually.

Display 8.6--the environmental quality account--reveals how the EQ alternative affects: areas of natural beauty; the quality of water,

Table 8.8. EQ alternative plan costs and benefits, Tombigbee River Basin, 1990 and 2020

Components and elements	Total plan			Early action plan	
	Total installation cost	Average annual			
		Cost	Benefits	Cost	Benefits
	Thousand dollars				
Flood damage reduction plan elements	66,517.2	4,278.7	3,484.5	2,960.9	2,645.1
Wetness hazard damage reduction plan elements	11,287.9	4,044.4	1/	3,893.1	1/
Erosion damage reduction critical area plan elements	29,979.0	4,838.9	1/	4,838.9	1/
Management systems - other area plan elements	79,805.8	12,162.6	1/	11,813.3	1/
Recreation					
Swimming beaches	1,605.0				
Picnicking area sites	4,020.0				
Camping area sites	4,575.0				
Total	10,200.0	2/ 2,156.3	2/ 6,559.0	2/ 1,519.0	2/ 4,570.0
Improved wildlife population	4,000.0	1,845.6	2,400.0	0	0
Animal waste treatment	2,970.0	627.8	1/	583.4	1/
Preserve environmental elements	18,500.0	1,784.1	1/	919.3	1/
Total	223,259.9	31,738.4	X X	26,527.9	X X

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Not evaluated.
2/ Average annual cost and benefits for swimming, picnicking and camping.

DISPLAY 8.5

EQ ALTERNATIVE EARLY ACTION PLAN, 1990

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measure of effects (Average annual) 1/ 2/
Beneficial effects:	Thousand dollars
A. The value to users of increased outputs of goods and services.	
1. Flood prevention	1,907.9
2. Recreation	3,539.7
3. Utilization of unemployed and underemployed labor resources	
a. Project construction	427.7
Total beneficial effects	5,875.3
Adverse effects:	
A. The value of resources required for a plan.	
1. Floodwater retarding structures and recreation facilities	
a. Project installation	3,269.9
b. OM&R	1,210.0
Total adverse effects	4,479.9
Net beneficial effects	1,395.4

Source: River Basin Staff, United States Department of Agriculture.

1/ 100 years at 6 1/8 percent interest.

2/ Land treatment, animal waste, and preservation of environmental elements effects were not evaluated. Land treatment installation costs total $121.1 million with an annual cost of $20.5 million; animal waste installation costs total $2.8 million with an annual cost of $583.4 thousand; and preservation of environmental elements installation costs total $11.5 million with an annual cost of $919.3 thousand.

DISPLAY 8.6

EQ ALTERNATIVE EARLY ACTION PLAN, 1990

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Effects
Beneficial and adverse effects:	
A. Areas of natural beauty.	1. Improve the aesthetic quality by flood protection of 378,600 acres. 2. Create 13,040 acres of primarily large water impoundments. 3. Inundate 5,085 acres of forestland and stream bottoms. 4. Reduce erosion on 2,761,800 acres. 5. Improve aesthetic quality of streamsides by 609 miles of streambank stabilization. 6. Preservation of 29 natural and scenic areas, 440 archaeological sites, and 31 historic sites.
B. Quality considerations of water, land, and air.	1. Storage of 82,400 acre-feet of sediment. 2. Reduce sediment yield from subbasins by 4,755,000 tons. 3. Reduce erosion on 2,761,800 acres. 4. Improve quality of lands and waters by flood damage reduction on 378,600 acres. 5. Improve water and land resources by stabilizing 609 miles of streambanks. 6. Creation of 13,040 acres of water in place of forest, pasture, and cropland. 7. Reduce agricultural pollution by installing 552 animal waste treatment units.
Beneficial and adverse effects:	
C. Biological resources and selected ecosystems.	1. Create 13,040 acres of flatwater fish habitat. 2. Provide 13,040 acres of water area for migratory waterfowl. 3. Inundate 5,085 acres of good wildlife habitat - 3,705 acres of bottomland hardwoods; 1,380 acres of upland timberland. 4. Improve wildlife habitat by providing watering places and additional edge cover at 262 floodwater retarding structures. 5. Restricted wildlife habitat on 4,780 acres of bottomland hardwoods and 5,835 acres of upland timberland in floodpools. 6. Reduced overwintering waterfowl habitat on 395,300 acres now protected from flooding. 7. Preserve 6 ecological communities.
D. Irreversible and irretrievable commitments of resources.	1. Conversion of 3,705 acres of bottomland hardwoods, 1,380 acres of upland timberland, and 7,955 acres of cropland and pasture into reservoir pools. 2. Use of construction materials and other resources for plan elements.

Source: River Basin Survey Staff, United States Department of Agriculture.

land, and air; biological resources and selected ecosystems; and the commitment of resources.

Display 8.7--the regional development account--provides the effects of the early action plan to Alabama and Mississippi and to the rest of the nation. The beneficial and adverse effects on income and employment are displayed.

Display 8.8--the social well-being account--presents the beneficial and adverse effects relating to: real income distribution; life, health, and safety; and recreational opportunities.

DISPLAY 8.7

EQ ALTERNATIVE EARLY ACTION PLAN, 1990

REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of Effects: Alabama and Mississippi (Average Annual)	Measures of Effects: Rest of Nation 1/ 2/
Income:		
Beneficial effects:	Thousand dollars	
A. The value of increased output of goods and services to users residing in the basin.		
1. Flood prevention	1,907.9	0.0
2. Recreation	3,539.7	0.0
3. Utilization of unemployed and underemployed labor resources		
a. Project construction	427.7	0.0
4. Additional wages and salaries accruing to the basin from implementation of the plan		
a. Project OM&R (structures)	6.0	- 6.0
b. Recreation service sector	233.6	-233.6
B. The net value of output to users residing in the basin from external economies.		
1. Net indirect activities associated with increased net returns from flood prevention and recreation	1,082.2	0.0
2. Net indirect and induced activities associated with utilization of regional unemployed and underemployed and other labor resources		
a. Farm hired labor	170.0	-170.0
b. Recreation service sector	46.7	- 46.7
c. Project OM&R	1.5	- 1.5
Total beneficial effects	7,415.3	-457.8

Components	Measures of Effects: Alabama and Mississippi (Average Annual)	Measures of Effects: Rest of Nation 1/ 2/
Income:		
Adverse effects:	Thousand dollars	
A. The value of resources contributed from within the basin to achieve the outputs.		
1. Floodwater retarding structures and recreation activities		
a. Project installation	794.5	2,475.4
b. OM&R	1,210.0	0.0
Total adverse effects	2,004.5	2,475.4
Net beneficial effects	5,410.8	-2,933.2

1/ 100 years @ 6 1/8 percent interest.
2/ Land treatment, animal waste, and preservation of environmental elements effects were not evaluated.

Components	Measures of Effects: Alabama and Mississippi	Measures of Effects: Rest of Nation
Employment:		
Beneficial effects:		
A. Increase in the number and types of jobs.		
1. Agricultural employment	Create 646 permanent jobs in agricultural production	-
2. Employment in recreation	Create 531 permanent jobs in recreation	-
3. Employment in construction	Create 1,042 man-years of labor for one year	-
4. Employment in project OM&R	Create 78 permanent jobs in operation and maintenance	-
5. Indirect and induced employment for project installation and output of project goods and services	Create 162 permanent semi-skilled jobs from indirect and induced employment	-
Total beneficial effects	Create 1,417 permanent semi-skilled jobs	-
	Create 1,042 man-years of labor in construction	-

Components	Measures of Effects: Alabama and Mississippi	Measures of Effects: Rest of Nation
Employment:		
Adverse effects:		
A. Decrease in number and types of jobs.		
1. Lost in agricultural employment of project take	139 permanent semi-skilled jobs in agricultural employment	-
2. Lost in indirect and induced employment associated with project take	24 permanent semi-skilled jobs	-
Total adverse effects	Lose 163 permanent semi-skilled jobs	-
Net beneficial effects	Create 1,254 permanent semi-skilled jobs	-
	Create 1,042 man-years of labor in construction	-

Source: River Basin Staff, United States Department of Agriculture.

DISPLAY 8.8

EQ ALTERNATIVE EARLY ACTION PLAN, 1990

SOCIAL WELL-BEING ACCOUNT

Components	Measures of effects
Beneficial and adverse effects:	
A. Real income distribution.	1. Create 1,417 low to medium income permanent jobs for area residents.
	2. The monetary benefit of $7,415,300 will provide opportunity to improve the income of about 28 percent of the families in the basin where incomes are below the poverty level.
B. Life health, and safety.	1. Increased output will be in soybeans, wheat, and livestock products.
	2. Reduce flood damages on 378.6 thousand acres.
C. Recreational opportunities.	1. Create 2.4 million recreation days primarily for a rural farm population.

Source: River Basin Staff, United States Department of Agriculture.

A Plan

General

This plan provides means for meeting some component needs for both the NED and EQ objectives. Some components of the NED objective are optimized and some components emphasize the EQ objective. The plan provides for some plan elements for all component needs identified. Efficiency of operations as well as insuring the quality of the basin's resources are of major concern. As the result of less channel modification than the NED plan, this plan provides for less flood damage reduction.

Land Use

Land use data for this plan are presented in table 8.9. The derivation of the land use estimates are predicated upon the same assumptions used in deriving land use for the NED plan; therefore, the estimates are the same. The assumptions are not repeated.

During the period 1970 to 1990, total cropland is essentially unchanged. A slight increase occurs by the year 2020. Total pastureland remains essentially unchanged. What is significant is that most pastureland will be improved in future years. Forestland will decline between 1970 and 2020, but the decline in acreage is not drastic. Other land is projected to increase over time to satisfy land requirements of an expanding economy.

Agricultural and Forestry Production

Plan A, with an identical land use and the same assumptions for developing the plan as for the NED plan, provides for the same agricultural production as the NED plan. This projected agricultural production for the basin's six major crops is shown in table 8.2.

Forestland acres and production for plan A are the same as the NED plan. The projected acreage will meet the demand for 336 million cubic feet of roundwood in 1990 and 500 million cubic feet in 2020. However, the capability of the reduced forest land base to supply more roundwood will require better management to accelerate growth and practices to increase timber utilization. This acceleration was discussed previously under the NED plan.

Table 8.9. Land use for the A plan, Tombigbee River Basin, 1970 and projected 1990 and 2020

Major use	1970	1990	2020
	1,000 acres	1,000 acres	1,000 acres
Cropland			
Harvested	936.8	949.0	1,127.9
Pastured	46.8	95.0	112.8
Idle	289.3	228.7	89.8
Total	1,272.9	1,272.7	1,330.5
Pastureland			
Improved	494.9	492.6	1,096.5
Unimproved	783.5	828.7	123.7
Total	1,278.4	1,321.3	1,220.2
Forestland 1/	5,785.3	5,665.0	5,635.0
Other uses 2/	466.5	544.1	617.4
Total	8,803.1	8,803.1	8,803.1

Source: Formulated by River Basin Survey Staff, United States Department of Agriculture.

1/ Includes all federal land.
2/ Includes all other land and water areas.

Components and Plan Elements

Components and plan elements for the A plan are presented in table 8.10. The components are flood damage reduction, wetness hazard damage reduction, erosion damage reduction, management systems, animal waste treatment, preservation of scenic areas, ecological communities, archaeological sites and historic sites, and recreation. Plan elements are identified under the components and are quantified for the early action and long range plans.

Flood damage reduction plan elements include 336 floodwater retarding structures and 710 miles of channel modification in the early action plan. The reduced miles of channel modification, compared to the NED plan, is the result of a reduction in the level of flood protection. The channel design criteria, in most instances, was based on the 0.25 year frequency flood. This allows flooding, on an average, to occur four times per year. Damage reduction is provided for in the 23 watersheds identified in Chapter VII as having potentials and needs for watershed projects. The total plan includes structures in 10 additional watersheds by the year 2020.

Table 8.10. Plan A alternative plan, Tombigbee River Basin, 1990 and 2020

Components and plan elements	Unit	Plan element quantities 1990	2020
Flood Damage Reduction			
Floodwater retarding structures	Number	1/ 336	2/ 469
Channel modification	Miles	710	1,083
Wetness Hazard Damage Reduction			
Cropland and pastureland			
Cropping management system	Acres	442,631	469,431
Pasture management system	Acres	334,673	288,673
Erosion Damage Reduction - Critical Area			
Gully stabilization			
Critical area planting	Acres	25,103	25,103
Strip mine stabilization			
Critical area planting	Acres	16,911	16,911
Streambank stabilization			
Vegetation and structural measures	Miles	609	609
Roadside vegetative cover	Acres	9,738	9,738
Cropland, pastureland and forestland stabilization			
Critical area planting	Acres	184,517	175,998
Land use conversion - cropland and pastureland to forestland	Acres	64,001	62,298
Land use conversion - cropland to pastureland	Acres	54,685	47,869
Pasture management system	Acres	105,014	98,198
Woodland management system	Acres	46,504	46,504
Management Systems - Other Areas			
Cropland, pastureland and forestland			
Cropping management system	Acres	320,878	341,278
Pasture management system	Acres	332,723	297,843
Woodland management system	Acres	1,814,585	1,814,585
Animal Waste Treatment			
Animal waste treatment units	Number	552	594
Preservation of Scenic Areas			
Non-disturbance	Number	15	25
Land acquisition	Acres	3,000	6,000
Land use restrictions	Acres	8,000	14,000
Preservation of Ecological Communities			
Land acquisition	Acres	500	1,000
Non-disturbance	Number	5	4
Preservation of Archaeological Sites			
National Register classification	Number	30	55
Land acquisition	Acres	300	600
Non-disturbance	Number	380	365
Preservation of Historic Sites			
National Register classification	Number	10	15
Land acquisition	Acres	10	17
Non-disturbance	Number	11	4
Recreation			
Swimming beach sites	Number	80	107
Picnicking area sites	Number	87	134
Camping area sites	Number	45	61
Improved wildlife populations	Acres	0	400,000

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Alabama - 1990: 111 FWRS
318 channels

2/ Alabama - 2020: 203 FWRS
575 channels

Land treatment plan elements provide for installation of practices to reduce damages caused by wetness and erosion hazards, to protect the land base, and to improve ease of management. The practices are for the entire basin. The early action plan provides for management systems to provide treatment on 442.6 thousand acres of cropland and 334.7 thousand acres of pastureland with a wetness hazard (table 8.10).

The early action plan provides for land treatment to reduce erosion and improve management. The measures will stabilize 25.1 thousand acres of gullies, 16.9 thousand acres of strip mines, 9.7 thousand acres of roadbanks, and 609 miles of streambanks. Further, the early action plan provides measures to treat 231.1 thousand acres of critical area; cropland, 68.4 thousand acres; pastureland, 100.7 thousand acres; and forestland, 62.0 thousand acres. In addition, plan elements of the early action plan provide management systems on 320.9 thousand acres of cropland, 332.7 thousand acres of pastureland, and 1,814.6 thousand acres of forestland for a total of 2.5 million acres.

The reduction of pollution from animal waste sources is provided for in the early action plan. A total of 552 animal waste treatment units will be installed throughout the basin.

The preservation of scenic areas, ecological communities, archaeological sites, and historic sites is enhanced by the proposed plan elements. The plan elements provide for non-disturbance, land acquisition, and land use restrictions. It is recommended that some sites be included in the National Register.

Recreation early action plan elements include swimming beach sites, picnicking sites, and camping sites. The long range plan elements include these plus an element to improve conditions for wildlife populations on 400.0 thousand acres.

Costs and Benefits

Structures, measures, and facilities proposed for installation by the year 2020 are estimated to cost $262.5 million (table 8.11). Plan elements total costs are $98.3 million for flood damage reduction; $128.5 million for land treatment; $14.2 million for recreation; $3.0 million for animal waste treatment; and $18.5 million for preservation of environmental elements.

The early action plan average annual costs are $32.0 million. Average annual benefits total $5.2 million for flood damage reduction and $4.6 million for recreation sites. Benefits were not evaluated for the other plan elements.

Table 8.11. Plan A alternative plan costs and benefits, Tombigbee River Basin, 1990 and 2020

Components and elements	Total plan			Early action plan	
	Total installation cost	Average annual			
		Cost	Benefits	Cost	Benefits
		Thousand dollars			
Flood damage reduction plan elements	98,343.0	6,605.0	6,632.0	4,524.4	5,160.4
Wetness hazard damage reduction plan elements	22,575.7	8,088.7	1/	7,786.1	1/
Erosion damage reduction critical area plan elements	29,979.0	4,838.9	1/	4,838.9	1/
Management systems - other area plan elements	75,966.1	12,014.1	1/	11,824.9	1/
Recreation					
Swimming beaches	1,605.0				
Picnicking area sites	4,020.0				
Camping area sites	4,575.0				
Total	10,200.0	2/ 2,156.3	2/ 6,559.0	2/ 1,519.0	2/ 4,570.0
Improved wildlife population	4,000.0	1,845.6	2,400.0	0	0
Animal waste treatment	2,970.0	627.8	1/	583.4	1/
Preserve environmental elements	18,500.0	1,784.1	1/	919.3	1/
Total	262,533.8	37,960.5	X X	31,996.0	X X

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Not evaluated.
2/ Average annual cost and benefits for swimming, picnicking, and camping.

Effectiveness to Meet Component Needs

The A plan provides plan elements for the early action and long range time frames. The elements meet some of the component needs for the NED and EQ objectives. Table 8.12 lists all of the component needs for both time frames. The effectiveness is shown by how many component needs are provided.

The total A plan meets 39 percent of the flood damage reduction component needs. It provides about 80 percent of the component needs for land treatment and management systems. About 100 percent of the recreation needs and animal waste treatment units are met. Sediment yield reduction component needs from sub-basins are reduced 39 percent. The plan is about 100 percent effective in preserving environmental elements as identified in table 8.12. Most of the recreation needs are met. The plan provides for the preservation of all or most of the environmental features with the exception of natural and scenic areas.

Plan Effects Displays

The beneficial and adverse effects of the A early action plan are displayed in four accounts. Display 8.9--the national economic development account--lists the total average annual beneficial effects as $8.0 million and the adverse effects as $6.0 million. Net beneficial effects total $2.0 million annually.

Display 8.10--the environmental quality account--reveals how the plan A affects: areas of natural beauty; the quality of water, land, and air; biological resources and selected ecosystems; and commitment of resources.

Display 8.11--the regional development account--provides the effects of the early action plan to Alabama and Mississippi and to the rest of the nation. The beneficial and adverse effects on income and employment are displayed.

Display 8.12--the social well-being account--presents the beneficial and adverse effects relating to: real income distribution; life, health, and safety; and recreational opportunities.

Table 8.12. Alternative plans effectiveness testing, Tombigbee River Basin, 1990 and 2020

Component needs	Units	Quantities needed		Alternative plan provisions											
				NED plan				EQ				Plan A			
		1990	2020	1990		2020		1990		2020		1990		2020	
				Provides	Remaining	Provides	Remaining	Provides	Remaining	Provides	Remaining	Provides	Remaining	Provides	Remaining
Flood damage reduction	Thou. ac.	690.6	690.6	395.3	295.3	582.4	108.2	378.6	312.0	548.2	142.4	395.3	295.3	582.4	108.2
	Thou. dol.	10,235.7	14,960.1	4,553.0	5,682.7	8,465.1	6,495.0	1,639.4	8,596.3	2,983.6	11,976.5	3,238.0	6,997.7	5,801.5	9,158.6
Wetness hazard damage reduction															
Cropland	Thou. ac.	553.3	586.8	442.6	110.7	469.4	117.4	221.3	332.0	234.7	352.1	442.6	110.7	469.4	117.4
Pastureland	Thou. ac.	418.3	360.8	334.7	83.6	288.7	72.1	167.3	251.0	144.3	216.5	334.7	83.6	288.0	72.8
Erosion damage reduction															
Critical areas															
Cropland	Thou. ac.	76.0	66.5	68.4	7.6	59.8	6.7	68.4	7.6	59.8	6.7	68.4	7.6	59.8	6.7
Pastureland	Thou. ac.	111.8	111.8	100.7	11.1	100.7	11.1	100.7	11.1	100.7	11.1	100.7	11.1	100.7	11.1
Forestland	Thou. ac.	77.5	77.5	62.0	15.5	62.0	15.5	62.0	15.5	62.0	15.5	62.0	15.5	62.0	15.5
Gully	Thou. ac.	27.9	27.9	25.1	2.8	25.1	2.8	25.1	2.8	25.1	2.8	25.1	2.8	25.1	2.8
Streambank	Miles	763.0	763.0	609.0	154.0	609.0	154.0	609.0	154.0	609.0	154.0	609.0	154.0	609.0	154.0
Strip mine	Thou. ac.	18.8	18.8	16.9	1.9	16.9	1.9	16.9	1.9	16.9	1.9	16.9	1.9	16.9	1.9
Roadside	Thou. ac.	10.8	10.8	0.0	10.8	0.0	10.8	9.7	1.1	9.7	1.1	9.7	1.1	9.7	1.1
Management systems															
Other areas															
Cropland	Thou. ac.	401.1	426.6	320.9	80.2	341.3	85.3	263.9	137.2	222.5	204.1	320.9	80.2	341.3	85.3
Pastureland	Thou. ac.	415.9	372.3	332.7	83.2	297.8	74.5	400.5	15.4	446.3	0.0	332.7	83.2	297.8	74.5
Forestland	Thou. ac.	2,268.2	2,268.2	1,814.6	453.6	1,814.6	453.6	1,814.6	453.6	1,814.6	453.6	1,814.6	453.6	1,814.6	453.6
Land															
Cropland	Thou. ac.	1,272.7	1,330.5	1,272.7	0.0	1,330.5	0.0	1,158.9	113.8	1,035.3	295.2	1,272.7	0.0	1,330.5	0.0
Pastureland	Thou. ac.	1,321.3	1,220.2	1,321.3	0.0	1,220.2	0.0	1,435.1	0.0	1,515.8	0.0	1,321.3	0.0	1,220.2	0.0
Forestland	Thou. ac.	5,665.0	5,635.0	5,665.0	0.0	5,635.0	0.0	5,665.0	0.0	5,634.6	0.4	5,665.0	0.0	5,635.0	0.0
Recreation															
Swimming beaches	Thou. act. occ.	1,380.0	1,855.6	1,394.6	0.0	1,864.3	0.0	1,394.6	0.0	1,864.3	0.0	1,394.6	0.0	1,864.3	0.0
Picnicking	Thou. act. occ.	1,691.5	2,608.2	1,691.2	0.3	2,605.0	3.2	1,691.2	0.3	2,605.0	3.2	1,691.2	0.3	2,605.0	3.2
Camping	Thou. act. occ.	465.1	618.0	458.1	7.0	621.0	0.0	458.1	7.0	621.0	0.0	458.1	7.0	621.0	0.0
Hunting	Thou. man-days	0.0	391.5	0.0	0.0	400.0	0.0	0.0	0.0	400.0	0.0	0.0	0.0	400.0	0.0
Sediment yield reduction from sub-basins	Thou. tons	13,266.0	13,562.0	4,874.0	8,392.0	5,286.0	8,326.0	4,755.0	8,511.0	5,069.0	8,493.0	4,847.0	8,392.0	5,236.0	8,326.0
Animal waste treatment units	Numbers	552.0	594.0	0.0	552.0	0.0	594.0	552.0	0.0	594.0	0.0	552.0	0.0	594.0	0.0
Preserve environmental elements															
Natural and scenic	Numbers	57.0	64.0	0.0	57.0	0.0	64.0	29.0	28.0	51.0	13.0	29.0	28.0	51.0	13.0
Ecological comm.	Numbers	6.0	6.0	0.0	6.0	0.0	6.0	6.0	0.0	6.0	0.0	6.0	0.0	6.0	0.0
Archaeological sites	Numbers	452.0	484.0	0.0	452.0	0.0	484.0	440.0	12.0	480.0	4.0	440.0	12.0	480.0	4.0
Historic sites	Numbers	31.0	36.0	0.0	31.0	0.0	36.0	31.0	0.0	36.0	0.0	31.0	0.0	36.0	0.0

Source: River Basin Survey Staff, United States Department of Agriculture.

DISPLAY 8.9

PLAN A ALTERNATIVE EARLY ACTION PLAN, 1990

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measure of effects (Average annual) 1/ 2/
Beneficial effects:	Thousand dollars
A. The value to users of increased outputs of goods and services.	
1. Flood prevention	3,860.5
2. Recreation	3,539.7
3. Utilization of unemployed and underemployed labor resources	
a. Project construction	593.2
Total beneficial effects	7,993.4
Adverse effects:	
A. The value of resources required for a plan.	
1. Floodwater retarding structures and recreation facilities	
a. Project installation	4,649.3
b. OM&R	1,394.1
Total adverse effects	6,043.4
Net beneficial effects	1,950.0

Source: River Basin Staff, United States Department of Agriculture.

1/ 100 years at 6 1/8 percent interest.

2/ Land treatment, animal waste, and preservation of environmental elements effects were not evaluated. Land treatment installation costs total $127.2 million with an annual cost of $24.4 million; animal waste installation costs total $2.8 million with an annual cost of $583.4 thousand; and preservation of environmental elements installation costs total $11.5 million with an annual cost of $919.3 thousand.

DISPLAY 8.10

PLAN A ALTERNATIVE EARLY ACTION PLAN, 1990

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Effects
Beneficial and adverse effects:	
A. Areas of natural beauty.	1. Improve the aesthetic quality by flood protection of 395,300 acres. 2. Loss of 9,900 acres of bottomland hardwoods along planned channel alterations. 3. Create 16,590 acres of primarily large water impoundments. 4. Inundate 6,375 acres of forest and stream bottoms. 5. Disruption of streamside vegetation along 710 miles of stream to be altered. 6. Permanent loss of 840 acres of vegetation to channels. 7. Reduce erosion on 2,751,000 acres. 8. Improve the aesthetic quality of streams by 609 miles of streambank stabilization. 9. Preservation of 29 natural and scenic areas, 440 archaeological sites, and 31 historic sites.
B. Quality considerations of water, land, and air.	1. Storage of 105,000 acre-feet of sediment behind dams. 2. Reduce sediment yield from subbasins by 4,874,000 tons. 3. Temporary disruption of streamside vegetation on 710 miles of channels to be altered. 4. Reduce erosion on 2,751,000 acres. 5. Improve quality of lands and waters by flood damage reduction on 395,300 acres. 6. Improve water and land resource by stabilization of 609 miles of streambanks. 7. Creation of 16,590 acres of lakes in place of forest, pasture, and cropland. 8. Reduce agricultural pollution by installing 552 animal waste treatment units.
Beneficial and adverse effects:	
C. Biological resources and selected ecosystems.	1. Create 16,590 acres of flat-water fish habitat. 2. Provide 16,590 acres of resting area for migratory waterfowl. 3. Inundate 6,375 acres of good wildlife habitat--4,635 acres of bottomland hardwoods and 1,740 acres of upland timberlands. 4. Improve wildlife habitat by providing watering places and additional edge cover at 336 floodwater retarding structures. 5. Restricted wildlife habitat on 6,210 acres of bottomland hardwoods and 7,535 acres of upland timberland in flood pools. 6. Reduce quality of wildlife habitat on 9,900 acres of bottomland hardwoods along planned channel alterations. 7. Reduced overwintering waterfowl habitat on 395,300 acres now protected from flooding. 8. Preserve 6 ecological communities.
D. Irreversible and irretrievable commitments of resources.	1. Conversion of 4,635 acres of bottomland hardwoods, 1,740 acres of upland timberland and 10,215 acres of cropland and pasture into reservoir pools. 2. Loss of 840 acres of land to channels. 3. Use of construction materials and other resources for plan elements.

Source: River Basin Survey Staff, United States Department of Agriculture.

DISPLAY 8.11

PLAN A ALTERNATIVE EARLY ACTION PLAN, 1990

REGIONAL DEVELOPMENT ACCOUNT

Components	Measures of Effects: Alabama and Mississippi (Average Annual)	Measures of Effects: Rest of Nation 1/ 2/
Income:		
Beneficial effects:	Thousand dollars	
A. The value of increased output of goods and services to users residing in the basin.		
1. Flood prevention	3,860.5	0.0
2. Recreation	3,539.7	0.0
3. Utilization of unemployed and underemployed labor resources		
a. Project construction	593.2	0.0
4. Additional wages and salaries accruing to the basin from implementation of the plan		
a. Project OM&R (structures)	15.0	- 15.0
b. Recreation service sector	233.6	-233.6
B. The net value of output to users residing in the basin from external economies.		
1. Net indirect activities associated with increased net returns from flood prevention and recreation	1,470.6	0.0
2. Net indirect and induced activities associated with utilization of regional unemployed and underemployed and other labor resources		
a. Farm hired labor	180.0	-180.0
b. Recreation service sector	46.7	- 46.7
c. Project OM&R	12.1	- 12.1
Total beneficial effects	9,952.1	-488.1

Components	Measures of Effects: Alabama and Mississippi (Average Annual)	Measures of Effects: Rest of Nation 1/ 2/
Income:		
Adverse effects:	Thousand dollars	
A. The value of resources contributed from within the basin to achieve the outputs.		
1. Floodwater retarding structures and recreation activities		
a. Project installation	1,293.9	3,355.4
b. OM&R	1,394.1	0.0
Total adverse effects	2,688.0	3,355.4
Net beneficial effects	7,264.1	-3,843.5

1/ 100 years @ 6 1/8 percent interest.

2/ Land treatment, animal waste, and preservation of environmental elements effects were not evaluated.

Components	Measures of Effects: Alabama and Mississippi	Measures of Effects: Rest of Nation
Employment:		
Beneficial effects:		
A. Increase in the number and types of jobs.		
1. Agricultural employment	Create 1,390 permanent jobs in agricultural production	-
2. Employment in recreation	Create 531 permanent semi-skilled jobs in recreation	-
3. Employment for project construction	Create 1,474 man-years of labor for one year	-
4. Employment for project OM&R	Create 89 permanent semi-skilled jobs	-
5. Indirect and induced employment for project installation and output of project goods and services	Create 220 permanent semi-skilled jobs	-
Total beneficial effects	Create 2,230 permanent semi-skilled jobs Create 1,474 man-years of labor in construction	- -

Components	Measures of Effects: Alabama and Mississippi	Measures of Effects: Rest of Nation
Employment:		
Adverse effects:		
A. Decrease in number and types of jobs.		
1. Lost in agricultural employment of project take area	132 permanent semi-skilled jobs in agricultural employment	-
2. Lost in indirect and induced employment associated with project take area	27 permanent semi-skilled jobs	-
Total adverse effects	Lose 159 permanent semi-skilled jobs	-
Net beneficial effects	Create 2,071 permanent semi-skilled jobs Create 1,474 man-years of labor in construction	- -

Source: River Basin Staff, United States Department of Agriculture.

DISPLAY 8.12

PLAN A ALTERNATIVE EARLY ACTION PLAN, 1990

SOCIAL WELL-BEING ACCOUNT

Components	Measures of effects
Beneficial and adverse effects:	
A. Real income distribution.	1. Create 2,230 low to medium income permanent jobs for area residents.
	2. The monetary benefit of $9,952,100 will provide opportunity to improve the income of about 28 percent of the families in the basin where incomes are below the poverty level.
B. Life, health, and safety.	1. Increased output will be in soybeans, wheat, and livestock products.
	2. Reduce flood damages on 395.3 thousand acres.
C. Recreational opportunities.	1. Create 2.4 million recreation days primarily for a rural farm population.

Source: River Basin Staff, United States Department of Agriculture.

CHAPTER IX

SUGGESTED PLAN

Plan Selection

Three alternative plans were formulated--NED, EQ, and A. Salient features were discussed in Chapter VIII. The plans provide for some needs that are common to all and in some cases are identical. All alternatives include flood damage reduction plan elements. The NED plan provides for a 57 percent reduction in flood damages in 33 watersheds, accomplished with major plan elements of floodwater retarding structures and channel modifications. The EQ plan provides for a 20 percent reduction in flood damages in 33 watersheds with only floodwater retarding structures. The A plan reduces flood damages by 39 percent in the same 33 watersheds. The same major plan elements, floodwater retarding structures, and channel modifications as included in the NED plan, provide for this reduction. Channel modification for plan A includes fewer miles than included in the NED plan.

The major land uses for the NED and A plans are identical. These plans provide for crop and pasture products that have an annual gross value that exceeds without plan values and the value of production associated with the EQ alternative. A comparison of gross returns is presented in table 9.1. Except for cropland and pastureland, the land requirements for forestland and for other are about the same for all three alternative plans.

Table 9.1. Projected crops and pasture annual gross returns, Tombigbee River Basin, 1990 and 2020

Year	Gross returns			
	Without plan	Alternative plan		
		NED	A	EQ
	Million dollars	Million dollars	Million dollars	Million dollars
1990	102.2	108.4	108.4	103.7
2020	146.8	172.1	172.1	150.0

Source: Economic Research Service, United States Department of Agriculture.

Land treatment plan elements for erosion damage reduction, wetness hazard damage reduction, and management systems are about the same for all alternatives.

The EQ and A plans include measures to reduce pollution from animal wastes and to preserve environmental elements.

All three alternative plans provide the same plan elements to satisfy recreation needs.

Plan A comes closest to meeting the identified NED and EQ component needs, except for flood damage reduction. The NED plan is the most effective for this purpose.

The total beneficial effects and net beneficial effects of the alternative plans are compared below.

Alternative Plan	Total Beneficial Effects	Net Beneficial Effects
	Thousand Dollars	
NED	9,763.1	2,153.9
EQ	5,875.3	1,395.4
A	7,993.4	1,950.0

Only those watersheds with the most potential for flood damage reduction are included in the suggested plan. Also for those watersheds included, a design criteria for channel modification was selected that required a minimum of channel disturbance and still provided for a fairly effective reduction in flood damages. Channel clearing, in most instances, is the kind of work required. Stabilization structures are included to insure the installation of stable channels, as required by USDA criteria.

The suggested plan will add to the overall betterment of the basin--economic, social, and environmental. This is based on the effectiveness of the plan elements to minimize or alleviate undesirable conditions or satisfy a need that exists or will exist in the future. The suggested plan provides $7.3 million in beneficial effects to national economic efficiency. Net beneficial effects are $2.3 million.

Plan Features

Land Use

Land use for the A plan or suggested plan was presented for major use categories for the entire basin in Chapter VIII, table 8.9. Land use for the suggested plan is disaggregated and presented for each sub-basin in

table 9.2. The derivation of the land use is predicated on the assumptions enumerated in Chapter VIII for the NED plan.

Projected land use changes are minimal. Changes for major use categories are as follows during the period 1970 to 2020, respectively: cropland--increases from 1,272.9 thousand acres to 1,330.5 thousand acres; pastureland--decreases from 1,278.4 thousand acres to 1,220.2 thousand acres; forestland--decreases from 5,785.3 thousand acres to 5,635.0 thousand acres; and other--increases from 466.5 thousand acres to 617.4 thousand acres.

Structural Measures

Structural measures to reduce flood damages include floodwater retarding structures, channel modification, and a combination of floodwater retarding structures and channels. The number of floodwater retarding structures and miles of channels are identified by sub-basin and summarized for the basin in table 9.3. The watersheds that include flood damage plan elements are located on map 9.1.

Flood damage reduction plan elements include 231 floodwater retarding structures and 550 miles of channel modification in 19 watersheds by 1990. These measures will control floodwater from 529 thousand acres or 28 percent of the total area of the watersheds.

An additional 138 floodwater retarding structures and 347 miles of channel modification in 7 other watersheds are proposed by the year 2020. These measures will control floodwater from 281 thousand acres or 25 percent of the total area of the watersheds.

As stated previously, channel modification is based on a design criteria that allows flooding, on an average, of about four times per year. It consists primarily of channel clearing but is necessary for an effective flood damage reduction.

During detailed planning, all flood control work must be planned considering economic, social, and environmental components.

Recreation structural measures, expressed in number of sites, are presented in table 9.4. The number of sites are presented for each PDD or for that part of the PDD located in the basin. The early action plan--by year 1990--provides for the installation of 80 swimming beaches, 87 picnicking area sites, and 45 camping area sites. The long range plan--by year 2020--includes 107 swimming beaches, 134 picnicking area sites, and 61 camping area sites.

Each planning and development district has a need for one or more swimming beaches and picnicking area sites. All but PDD 6 in Mississippi

Table 9.2. Major land use for the suggested plan, by sub-basin, Tombigbee River Basin, 1970 and projected 1990 and 2020

Sub-basin and year	Major uses				
	Cropland	Pastureland	Forestland[1/]	Other uses[2/]	Total
	One thousand acres				
34 Upper					
1970	225.6	250.3	1,045.9	80.0	1,601.8
1990	226.0	258.1	1,013.3	104.4	1,601.8
2020	278.7	197.1	1,007.6	118.4	1,601.8
34 Lower					
1970	186.7	310.2	2,105.9	97.6	2,700.4
1990	162.5	345.5	2,078.8	113.6	2,700.4
2020	256.8	240.1	2,074.6	128.9	2,700.4
34a					
1970	190.5	81.4	439.0	47.7	758.6
1990	159.2	116.4	423.3	59.7	758.6
2020	104.0	167.9	419.0	67.7	758.6
34b					
1970	210.5	68.3	134.1	32.7	445.6
1990	226.7	53.9	128.9	36.1	445.6
2020	189.2	89.7	125.7	41.0	445.6
34c					
1970	77.5	37.7	425.8	24.0	565.0
1990	101.0	14.6	422.9	26.5	565.0
2020	74.7	40.3	419.9	30.1	565.0
34d					
1970	148.2	190.8	308.9	63.3	711.2
1990	149.9	195.5	295.9	69.9	711.2
2020	173.9	165.1	292.8	79.4	711.2
34e					
1970	57.2	40.0	378.7	31.5	507.4
1990	57.4	41.3	373.9	34.8	507.4
2020	51.6	45.7	370.6	39.5	507.4
34f					
1970	125.3	190.5	511.7	61.6	889.1
1990	135.3	186.6	499.2	68.0	889.1
2020	143.4	172.4	496.1	77.2	889.1
34h					
1970	51.4	109.2	435.3	28.1	624.0
1990	54.7	109.4	428.8	31.1	624.0
2020	58.2	101.9	428.7	35.2	624.0
Basin total					
1970	1,272.9	1,278.4	5,785.3	466.5	8,803.1
1990	1,272.7	1,321.3	5,665.0	544.1	8,803.1
2020	1,330.5	1,220.2	5,635.0	617.4	8,803.1

Source: Formulated by River Basin Survey Staff, United States Department of Agriculture.

1/ Includes all federal land.
2/ Includes all other land and water areas.

Table 9.3. Suggested plan components and plan elements, by sub-basin, Tombigbee River Basin, 1990 and 2020

Component and plan elements	Unit	Plan element quantities									
		34 upper		34 lower		34a		34b		34c	
		1990	2020	1990	2020	1990	2020	1990	2020	1990	2020
Flood damage reduction											
Floodwater retarding structures	Number	1/ 55	1/ 143	2/ 5	2/ 5	3/ 68	3/ 92	4/ 17	4/ 17	0	0
Channel modification	Miles	152	325	0	0	118	128	52	52	0	0
Wetness hazard damage reduction											
Cropland and pastureland											
Cropping management system	Acres	55,200	79,360	35,600	78,480	68,160	43,040	120,240	102,960	30,480	18,560
Pasture management system	Acres	69,360	41,600	99,680	51,600	34,880	58,320	9,115	25,435	1,182	12,942
Erosion damage reduction - critical area											
Gully stabilization											
Critical area planting	Acres	6,236	6,236	5,567	5,567	2,382	2,382	1,668	1,668	716	716
Strip mine stabilization											
Critical area planting	Acres	5,997	5,997	950	950	3,019	3,019	501	501	4,128	4,128
Streambank stabilization											
Vegetation and structural measures	Miles	76	76	166	166	43	43	57	57	38	38
Roadside vegetative cover	Acres	2,716	2,716	4,203	4,203	343	343	437	437	140	140
Cropland, pastureland and forestland stabilization											
Critical area planting	Acres	28,974	28,123	16,760	15,725	20,584	18,712	25,649	24,128	10,354	9,670
Land use conversion - cropland and pastureland to forestland and wildlife	Acres	11,118	10,948	4,310	4,103	5,264	4,890	8,180	7,876	3,166	3,029
Land use conversion - cropland to pastureland	Acres	6,131	5,450	7,380	6,552	12,246	10,748	10,375	9,158	4,925	4,378
Pasture management system	Acres	15,716	15,035	9,844	9,016	14,449	12,951	15,961	14,744	6,860	6,313
Woodland management system	Acres	6,422	6,422	7,817	7,817	2,612	2,612	4,523	4,523	985	985
Management systems - other areas											
Cropland, pastureland and forestland											
Cropping management system	Acres	58,770	77,010	71,120	103,440	35,360	16,480	35,200	22,080	45,200	36,320
Pasture management system	Acres	50,668	29,628	117,538	81,298	37,763	55,523	19,554	31,874	1,840	10,640
Woodland management system	Acres	278,902	278,902	636,154	636,154	165,322	165,322	74,482	74,482	178,597	178,597
Animal waste treatment											
Animal waste treatment units	Number	155	166	74	80	71	75	30	33	30	33

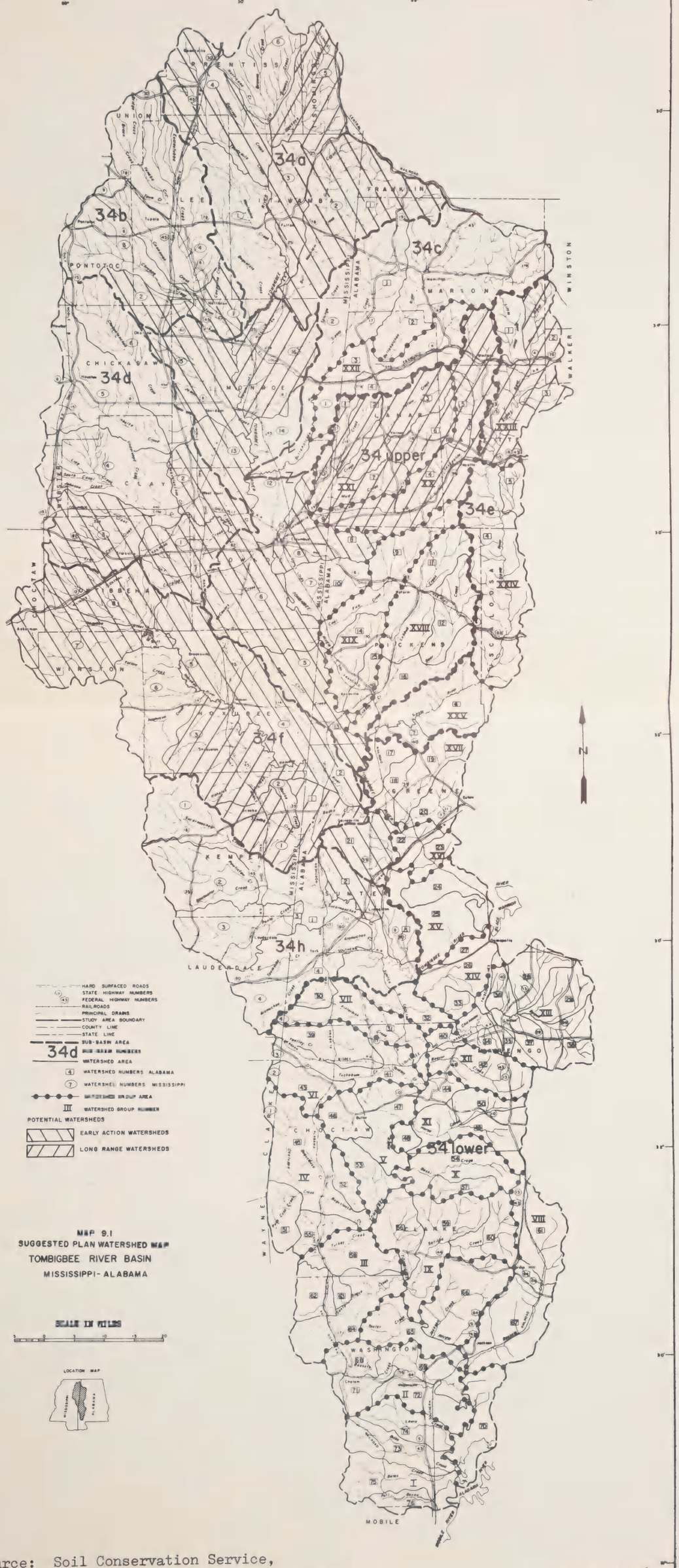
continued——

Table 9.3. Suggested plan components and plan elements, by sub-basin, Tombigbee River Basin, 1990 and 2020 (continued)

Components and plan elements	Unit	Plan element quantities									
		34d		34e		34f		34h		Basin total	
		1990	2020	1990	2020	1990	2020	1990	2020	1990	2020
Flood damage reduction											
Floodwater retarding structures	Number	5/ 31	5/ 31	6/ 0	6/ 8	7/ 49	7/ 67	8/ 6	8/ 6	2/ 231	2/ 369
Channel modification	Miles	89	89	0	97	131	198	8	8	550	897
Wetness hazard damage reduction											
Cropland and pastureland											
Cropping management system	Acres	61,535	72,495	16,320	14,080	45,256	48,856	9,840	11,600	442,631	469,431
Pasture management system	Acres	37,376	23,536	12,080	14,160	50,360	43,880	20,640	17,200	334,673	288,673
Erosion damage reduction - critical area											
Gully stabilization											
Critical area planting	Acres	3,761	3,761	518	518	3,387	3,387	868	868	25,103	25,103
Stripmine stabilization											
Critical area planting	Acres	660	660	792	792	806	806	58	58	16,911	16,911
Streambank stabilization											
Vegetation and structural measures	Miles	82	82	22	22	101	101	24	24	609	609
Roadside vegetative cover	Acres	164	164	510	510	746	746	479	479	9,738	9,738
Cropland, pastureland and forestland stabilization											
Critical area planting	Acres	28,855	27,568	11,054	10,640	26,105	25,664	16,182	15,768	184,517	175,998
Land use conversion - cropland and pastureland to forestland and wildlife	Acres	11,209	10,951	3,985	3,902	10,281	10,193	6,488	6,406	64,001	62,298
Land use conversion - cropland to pastureland	Acres	4,586	3,557	2,981	2,650	3,103	2,750	2,958	2,626	54,685	47,869
Pasture management system	Acres	14,648	13,619	6,221	5,890	12,608	12,255	8,707	8,375	105,014	98,198
Woodland management system	Acres	8,995	8,995	2,542	2,542	9,646	9,646	2,962	2,962	46,504	46,504
Management systems - other areas											
Cropland, pastureland and forestland											
Cropping management system	Acres	6,960	15,200	29,120	27,360	23,360	26,160	15,788	17,228	320,878	341,278
Pasture management system	Acres	13,408	2,928	11,040	12,480	43,742	38,862	37,170	34,610	332,723	297,843
Woodland management system	Acres	54,581	54,581	178,802	178,802	114,130	114,130	133,615	133,615	1,814,585	1,814,585
Animal waste treatment											
Animal waste treatment units	Number	83	90	26	28	66	71	17	18	552	594

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Alabama - 1990: 5 FWRS; 36 mi. channel; 2020: 75 FWRS; 166 mi. channel.
2/ Alabama - 1990: 5 FWRS; 2020: 5 FWRS.
3/ Alabama - 1990: 11 FWRS; 36 mi. channel; 2020: 11 FWRS; 36 mi. channel.
4/ Alabama - none; all structural measures in Mississippi.
5/ Alabama - none; all structural measures in Mississippi.
6/ Alabama - 2020: 8 FWRS; 97 mi. channel;
7/ Alabama - 1990: 6 FWRS; 11 mi. channel; 2020: 11 FWRS; 24 mi. channel.
8/ Alabama - 1990: 6 FWRS; 8 mi. channel; 2020: 6 FWRS; 8 mi. channel.
9/ Alabama - 1990: 33 FWRS; 91 mi. channel; 2020: 116 FWRS; 331 mi. channel.



MAP 9.1
SUGGESTED PLAN WATERSHED MAP
TOMBIGBEE RIVER BASIN
MISSISSIPPI - ALABAMA

Source: Soil Conservation Service,
United States Department of Agriculture

August, 1976

Table 9.4. Suggested recreation plan elements, by planning and development district, Tombigbee River Basin, 1990 and 2020

Plan elements and state portion	PDD	Unit	Plan element quantities	
			1990	2020
Swimming beach sites				
Alabama	1	Number	5	7
	2	Number	10	14
	6	Number	18	22
Mississippi	2	Number	4	5
	5	Number	15	23
	6	Number	24	30
	8	Number	4	6
Total			80	107
Picnicking area sites				
Alabama	1	Number	1	2
	2	Number	16	21
	6	Number	8	14
Mississippi	2	Number	5	7
	5	Number	26	41
	6	Number	25	39
	8	Number	6	10
Total			87	134
Camping area sites				
Alabama	1	Number	4	5
	2	Number	7	10
	6	Number	11	15
Mississippi	2	Number	2	3
	5	Number	17	23
	8	Number	4	5
Total			45	61
Improved wildlife population	NA	Acres	0	400,000

Source: River Basin Survey Staff, United States Department of Agriculture.

have a need for camping sites. Swimming beach sites provide for 40 percent of the total needs for swimming activity occasions, which is slightly more than the 34 percent of the total swimming needs estimated and allocated to beaches. The remaining needs are assumed to be met by urban type swimming facilities and are not provided for in this study. Each swimming beach site provides for a one-acre sand beach with a bathhouse facility to supply an estimated 17.4 thousand activity occasions per year. Sanitary facilities are provided for the picnicking or camping area sites to be located at each beach site.

A picnicking area site includes a two-acre area including 18 picnic tables, nine fireplace grills, nine garbage can installations, one two-unit comfort station, four drinking fountains, a water supply system, and parking area. Each unit will supply an estimated 19.4 thousand activity occasions per year.

A camping area site includes a five acre area including 30 camping units (table, garbage can, grill, and parking space), one comfort station with showers, a water supply system and four water fountains, and access roads as required. Each unit will furnish an estimated 10.2 thousand activity occasions per year.

Although not a structural measure, the suggested plan provides for improved wildlife habitat on 400.0 thousand acres by the year 2020. This improvement will be accomplished by installing measures, mostly land treatment, that support additional wildlife in a given area.

Land Treatment Measures

Essential elements of an effective land and water management system includes land treatment measures and management systems. The installation of an effective land treatment and management system program is basic for the development of water and related land resources.

Measures to reduce wetness hazards on cropland and pastureland are identified in table 9.3. The measures are quantified for each sub-basin and summarized for the basin.

Most of the proposed land treatment measures are erosion damage reduction and protection of the land base with a concomitant increase in soil productivity and management efficiency. Measures are listed for critical areas by sub-basin and summarized for the basin (table 9.3). In addition, acres requiring management systems are listed for other land areas.

The early action plan provides for treatment to reduce erosion on critical areas. The measures will stabilize 25.1 thousand acres of gullies, 16.9 thousand acres of strip mines, 9.7 thousand acres of roadbanks, and 609 miles of streambanks. Further, the early action plan provides measures

to treat 231.1 thousand acres of critical area; cropland, 68.4 thousand acres; pastureland, 100.7 thousand acres; and forestland, 62.0 thousand acres. In addition, plan elements of the early action plan provide management systems on 320.9 thousand acres of cropland, 332.7 thousand acres of pastureland, and 1,814.6 thousand acres of forestland for a total of 2.5 million acres.

Additional Plan Features

Additional plan features include provisions for the treatment of animal waste and preservation and protection of environmental elements.

The number of animal waste treatment units to reduce livestock and poultry pollution are presented for each sub-basin and the basin in table 9.3. A total of 552 animal waste treatment units are proposed by the year 1990.

The preservation of scenic areas, ecological communities, archaeological sites, and historic sites is enhanced by the plan elements listed in table 9.5. The plan elements provide for non-disturbance, land acquisition, land use restrictions, and inclusion of some sites in the National Register.

The early action plan provides plan elements to preserve 29 natural and scenic sites. This is to be accomplished by non-disturbance of 15 sites, land acquisition at 6 sites, and by land use restriction at 8 additional sites.

The ecological communities in the early action plan will be preserved by non-disturbance of 5 sites and land acquisition at 1 additional site.

Plan elements were postulated to preserve archaeological sites in the early action plan. The early action plan elements provide for preservation of 440 sites--380 by non-disturbance, 30 by land acquisition, and 30 recommended for National Register classification.

The 31 historic sites will be preserved. Eleven sites will be preserved by non-disturbance, 10 by land acquisition, and 10 recommended for National Register classification.

Non-Structural Measures

Additional measures, although not identified in this study as plan elements, are available to provide means to meet component needs. Opportunities exist during the implementation planning phase to include measures to meet needs. Such measures as land acquisition, relocation,

Table 9.5. Suggested plan for preservation of scenic, ecological, archaeological and historical sites, Tombigbee River Basin, 1990 and 2020

Components and plan elements	Unit	Plan element quantities					
		Alabama		Mississippi		Basin total	
		1990	2020	1990	2020	1990	2020
Preservation of scenic areas							
Non-disturbance	Number	6	10	9	15	15	25
Land acquisition	Acres	1,200	2,400	1,800	3,600	3,000	6,000
Land use restriction	Acres	3,200	5,600	4,800	8,400	8,000	14,000
Preservation of ecological communities							
Land acquisition	Acres	250	500	250	500	500	1,000
Non-disturbance	Number	2	2	3	2	5	4
Preservation of archaeological sites							
National Register classification	Number	10	15	20	40	30	55
Land acquisition	Acres	100	100	200	500	300	600
Non-disturbance	Number	30	5	350	360	380	365
Preservation of historical sites							
National Register classification	Number	6	10	4	5	10	15
Land acquisition	Acres	6	11	4	6	10	17
Non-disturbance	Number	7	3	4	1	11	4

Source: River Basin Survey Staff, United States Department of Agriculture.

flood warning system, and flood proofing may have some potential for damage reduction, although these measures were not evaluated. Other measures such as information and education, flood insurance, tax adjustment, post flood recovery, and land use regulations are means to modify the impacts of flooding. Also, non-structural measures include those to preserve environmental elements.

Environmental Considerations

Projects should have minimum detrimental effects and, when possible, should enhance the environment. The effects and changes that will result from proposed project construction will be recognized and identified to assist in deciding how to plan, design, install, and maintain a project.

Environmental elements that should be identified include effects on natural and scenic areas; ecological and biological resources; the quality of water, land, and air; and any irreversible and irretrievable commitment of resources. Techniques and measures to protect and enhance the environmental elements include design, installation, and maintenance. Design measures such as protection of special features, placement of spoil, specifications for vegetation, and inclusion of landscape items add to environmental quality. The effects of construction can be minimized by special techniques. Maintenance should include measures that are complimentary with environmental features.

Legal and Institutional Aspects

The suggested plan can be implemented by the various local, state, and federal agencies presently in existence in many areas of the basin. However, the acceleration and expansion of programs to some parts of the basin require that local sponsors be organized under present authorities. Where the programs are to be planned and installed under the Watershed Protection and Flood Prevention Act (Public Law 566), a local or state sponsor must meet certain legal requirements before these projects can be initiated. Additional expansion of the present Resource Conservation and Development Projects to include additional areas under the Food and Agriculture Act (Public Law 87-703) provides means to implement some plan elements.

All of the basin is organized in Soil Conservation Districts. The districts are eligible for assistance under the Soil Conservation Service Establishing Act (Public Law 46). However, to implement land treatment plan elements and the conservation systems on cropland, pastureland, and forestland may require the establishment of local or state organizations on a sub-basin level to accomplish this task. For the sediment yield reduction to be effective, the installation of measures to reduce erosion will require, in many instances, an organization to sponsor sub-basin plans. Cost-sharing that extends beyond the present programs of technical

assistance and critical area stabilization is needed. Some of these are established or can be established in the counties under programs of the Agricultural Stabilization and Conservation Service (ASCS). In any event, a basinwide program to implement the plan elements for erosion damage reduction is needed.

The local and state institutions that will be involved in the implementation of the plan include, among others, the following:

Alabama

Alabama Development Office.
Northwest Alabama Council of Local Government.
West Alabama Planning and Development Council.
Alabama-Tombigbee Rivers Regional Planning and Development Commission.
Alabama Department of Conservation and Natural Resources.
Alabama State Forestry Commission.
Alabama Historical Commission.
Alabama Water Improvement Commission.
Soil and Water Conservation Districts.
Water Managements or Drainage Districts.
State Soil and Water Conservation Committee.
Watershed Conservancy Districts.

Mississippi

Mississippi Board of Water Commissioners.
Tombigbee River Valley Water Management District.
Northeast Mississippi Planning and Development District.
Three Rivers Planning and Development District.
Golden Triangle Planning and Development District.
East Central Mississippi Planning and Development District.
Mississippi Game and Fish Commission.
Mississippi Park Commission.
Mississippi Forestry Commission.
Mississippi Department of Archives and History.
Soil and Water Conservation Districts.
Water Management or Drainage Districts.
State Soil and Water Conservation Committee.

To implement some parts of the plan will require that additional local or state districts be established.

Costs and Benefits

Suggested plan costs and benefits are presented in table 9.6. For the year 2020, total installation costs are presented for all plan elements comprising identified components for an identified subdivision and

Table 9.6. Suggested plan costs and benefits, Tombigbee River Basin, 1990 and 2020

Components and total plan elements	Total plan			Early action plan	
	Total installation cost	Average annual			
		Cost	Benefits	Cost	Benefits
	Thousand dollars				
Flood damage reduction plan elements					
Sub-basin 34 Upper	27,993.0	1,851.9	1,858.2	904.3	1,030.1
34 Lower	1,500.0	102.0	125.0	102.0	125.0
34 a	15,068.0	989.3	1,277.7	815.6	1,137.3
34 b	3,183.0	213.1	322.4	213.1	322.4
34 c	0.0	0.0	0.0	0.0	0.0
34 d	7,927.0	519.9	715.7	519.9	715.7
34 e	2,902.0	202.8	246.8	0.0	0.0
34 f	18,609.0	1,230.4	1,274.8	879.3	1,004.7
34 h	1,075.0	70.6	70.9	70.6	70.9
Sub-total	78,257.0	5,180.0	5,891.5	3,504.8	4,406.1
Wetness hazard damage reduction plan elements					
Sub-basin 34 Upper	3,747.4	1,258.0	1/	1,201.2	1/
34 Lower	4,478.6	1,290.4	1/	1,232.6	1/
34 a	3,080.9	1,113.0	1/	1,060.2	1/
34 b	3,089.5	1,440.3	1/	1,433.4	1/
34 c	870.6	371.6	1/	354.0	1/
34 d	2,678.5	1,054.2	1/	1,006.2	1/
34 e	823.4	290.1	1/	284.9	1/
34 f	2,828.3	974.7	1/	930.6	1/
34 h	978.5	296.4	1/	283.0	1/
Sub-total	22,575.7	8,088.7	1/	7,786.1	1/
Erosion damage reduction critical area plan elements					
Sub-basin 34 Upper	5,240.5	845.9	1/	845.9	1/
34 Lower	4,207.7	679.2	1/	679.2	1/
34 a	3,561.8	574.9	1/	574.9	1/
34 b	3,459.2	558.3	1/	558.3	1/
34 c	1,979.3	319.5	1/	319.5	1/
34 d	4,038.0	651.8	1/	651.8	1/
34 e	1,501.2	242.3	1/	242.3	1/
34 f	4,019.0	648.7	1/	648.7	1/
34 h	1,972.3	318.3	1/	318.3	1/
Sub-total	29,979.0	4,838.9	1/	4,838.9	1/
Management systems other area plan elements					
Sub-basin 34 Upper	11,902.7	1,934.9	1/	1,901.5	1/
34 Lower	24,934.8	3,835.2	1/	3,768.8	1/
34 a	7,882.3	1,211.0	1/	1,190.9	1/
34 b	4,500.3	747.0	1/	734.6	1/
34 c	6,284.9	1,072.4	1/	1,054.6	1/

Components and total plan elements	Total plan			Early action plan	
	Total installation cost	Average annual			
		Cost	Benefits	Cost	Benefits
	Thousand dollars				
Management systems other area plan elements (continued)					
Sub-basin 34 d	2,367.7	362.9	1/	356.6	1/
34 e	6,066.5	987.9	1/	976.3	1/
34 f	6,020.6	952.4	1/	947.1	1/
34 h	6,006.3	910.4	1/	894.5	1/
Sub-total	75,966.1	12,014.1	1/	11,824.9	1/
Recreation					
1. Swimming beaches picnicking area sites and camping area sites					
Alabama PDD 1	540.0	114.2	278.1	85.6	194.8
2	1,590.0	336.1	975.0	244.2	719.0
6	1,875.0	396.3	1,052.8	282.2	756.5
Mississippi PDD 2	510.0	107.8	327.0	76.1	240.7
5	3,300.0	697.7	1,864.4	482.0	1,228.9
6	1,620.0	342.5	1,608.1	234.7	1,133.8
8	765.0	161.7	453.6	114.2	296.3
Sub-total	10,200.0	2,156.3	6,559.0	1,519.0	4,570.0
2. Improved wildlife population - basin	4,000.0	1,845.6	2,400.0	0.0	0.0
Sub-total	14,200.0	4,001.9	8,959.0	1,519.0	4,570.0
Animal waste treatment plan elements					
Sub-basin 34 Upper	830.0	175.5	1/	163.8	1/
34 Lower	400.0	84.6	1/	78.2	1/
34 a	375.0	79.2	1/	75.0	1/
34 b	165.0	34.9	1/	31.7	1/
34 c	165.0	34.9	1/	31.7	1/
34 d	450.0	95.1	1/	87.7	1/
34 e	140.0	29.6	1/	27.5	1/
34 f	355.0	75.0	1/	69.8	1/
34 h	90.0	19.0	1/	18.0	1/
Sub-total	2,970.0	627.8	1/	583.4	1/
Preserve environment elements plan elements					
Alabama	7,700.0	770.8	1/	400.1	1/
Mississippi	10,800.0	1,013.3	1/	519.2	1/
Sub-total	18,500.0	1,784.1	1/	919.3	1/
Grand total - basin	242,447.8	36,535.5	X X	30,976.4	X X

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Not evaluated.

summarized for the basin. Average annual costs for the long range plan--by year 2020--are presented for all plan elements comprising identified components for each subdivision. Average annual benefits for the long range plan are restricted to flood damage reduction and recreation which includes improvement of wildlife habitat.

Costs and benefits for the early action plan--by year 1990--are presented in the same manner as for the long range plan. The exception is that table 9.6 does not present the total installation cost of the early action plan. This cost was calculated and is described in subsequent paragraphs.

Long range installation costs total $242.4 million. The average annual cost is $36.5 million. Average annual benefits for the elements estimated--flood damage reduction, recreation facilities, and wildlife improvements--total $14.9 million, with average annual costs of $9.2 million. This results in an overall benefit-cost ratio of 1.6 for these measures where both costs and benefits were estimated.

The total installation cost for the early action suggested plan is $201.7 million. It includes installation of plan elements to reduce flood damages ($53.1 million); land treatment ($127.2 million) to reduce wetness hazards on cropland and pastureland and to reduce erosion on critical areas and provide management systems on other areas; and to install recreation facilities ($7.2 million); to install animal waste treatment units ($2.8 million); and to preserve environmental elements ($11.4 million). The average annual cost, including operation and maintenance, is $31.0 million.

The average annual costs for structural measures to reduce flood damages in the 19 early action watersheds total $3.5 million. The average annual benefits total $4.4 million and the resulting benefit-cost ratio is 1.3 to 1.0. The average annual benefits for recreation facilities are $4.6 million and average annual costs are $1.5 million. The benefit-cost ratio is 3.1 to 1.0.

Other average annual costs for the early action plan include $24.5 million for land treatment measures, $583.0 thousand for animal waste treatment, and $919.0 thousand for preservation of environmental elements.

Plan Impacts

General Environmental

Installation of most plan elements will contribute to the overall improvement of environmental quality within the basin. Although losses will occur to certain types of natural habitat for wildlife, the result is a general improvement in the environment for basin residents.

Beneficial impacts from applied conservation practices to reduce erosion will accrue on 2.8 million acres by 1990. Adverse impacts will affect 18.1 thousand acres by inundation and loss of lands and loss of vegetation along channels to be modified.

Flooding, erosion, and sediment damages will be reduced. Revegetation of critical areas, planting of trees, installation of terraces, woodland stand improvement, and other conservation practices will help improve the aesthetic quality of the landscape.

Water quality will be improved by the combined results of all practices which hold soil in place and reduce pollution. In particular, installed animal waste treatment units will reduce pollution from livestock and poultry waste.

Scenic, archaeological, historic, and ecological areas will be identified and preserved. Impetus most likely will be generated to guarantee the preservation of these areas and enhance the basin's environmental appeal.

The impacts on wildlife and fish habitat are discussed later. However, in the vein of environmental quality, as this type of habitat is affected so will the basin's total environment be affected. Quality and diversity of all aspects of the natural environment are what create a pleasing environment for basin residents. Implementation of this plan should help maintain a balance between these two environmental attributes as well as provide for ways for basin residents to participate in activities involving the total environment.

During detailed planning, the implementing federal and/or state agencies should re-examine each water resource development project and make appropriate modifications to minimize and mitigate adverse impacts on the environment. This should include consideration of all resource values necessary for the orderly development of water and related land resources.

Recreation

Improved and expanded recreation facilities will result from implementation of the early action plan. USDA programs, along with programs of sponsors, states, and other federal agencies, will provide for additional outdoor recreational facilities for swimming, picnicking, and camping. Some facilities will be developed on land around existing reservoirs and others will be located on land adjacent to new reservoirs. Although there is ample water for fishing in the basin, there is a dearth of recreation facilities at lake sites. Providing additional facilities in deficit areas will have a significant impact on the social well-being of basin residents.

Fish and Wildlife Resources

The impacts on fish and wildlife resulting from implementation of the suggested plan include the combined effects of land use changes that affect the quantity and quality of fish and wildlife habitat. The land use for present, without plan, and with plan conditions are shown in table 9.7. Although some of these projected with plan changes will adversely affect the basin's fish and wildlife resources, the changes are generally not as extreme as under without plan conditions. Also, some of the projected changes are not the result of elements of the suggested plan. The discussion of impacts on the fish and wildlife resources resulting from the suggested plan are restricted to those expected to occur between 1970 and 1990.

Table 9.7. Land use for present, without plan conditions and with suggested plan conditions, Tombigbee River Basin, 1970 and projected 1990 and 2020

Major use	1970	1990		2020	
	Present	Without	With	Without	With
	1,000 acres				
Cropland					
Harvested	936.8	972.1	949.0	1,204.0	1,127.9
Pastured	46.8	96.4	95.0	120.4	112.8
Idle	289.3	302.0	228.7	125.8	89.8
Total	1,272.9	1,370.5	1,272.7	1,450.2	1,330.5
Pastureland					
Improved	494.9	826.0	492.6	1,342.1	1,096.5
Unimproved	783.5	575.2	828.7	175.1	123.7
Total	1,278.4	1,401.2	1,321.3	1,517.2	1,220.2
Forestland 1/	5,785.3	5,487.3	5,665.0	5,218.3	5,635.0
Other uses 2/	466.5	544.1	544.1	617.4	617.4
Total	8,803.1	8,803.1	8,803.1	8,803.1	8,803.1

Source: Formulated by River Basin Survey Staff, United States Department of Agriculture.

1/ Includes all federal land.
2/ Includes all other land and water areas.

Harvested cropland and pastured cropland are projected to increase by 12.2 and 48.2 thousand acres respectively during the period 1970 to 1990. However, there would be an increase of 35.3 and 49.6 thousand acres, respectively, during this same period under without plan conditions. The combined effects of these changes would be much more severe under without plan conditions. The harvested cropland will be used for cotton, soybeans, corn, wheat, oats, and hay. Other than cotton acreage, additional harvested acres will provide supplemental food for small game, forest game, and migratory birds such as dove, duck, and other non-game species. The impact of an increase in harvested cropland and pastured cropland will be negative to the wildlife resources--primarily a loss of valuable wildlife food and cover habitat.

Idle cropland shows a net loss of 60.6 thousand acres between 1970 and 1990. This is a serious loss of generally high quality habitat for small game and deer. Under without plan conditions, there would be a net gain of this valuable habitat of 12.7 thousand acres between 1970 and 1990.

Pastureland is projected to increase by 42.9 thousand acres between 1970 and 1990. This will create a loss of better habitat as woodlands or idle lands are converted to pastureland which is considered low quality habitat. However, under without plan conditions, this effect would be much worse as 122.8 thousand acres would be put into pastureland.

There is a net loss of 120.3 thousand acres of forestland between 1970 and 1990 under with plan conditions. Without plan conditions create a loss of 298.0 thousand acres, over twice the with plan effects. This is probably the most damaging land use change as far as fish and wildlife values are concerned. Some of this loss will likely result from clearing bottomland hardwood, mixed upland pine hardwood, and upland hardwood timber types. These are extremely important for forest game habitat. There is no substitution for hardwood forest for squirrel and turkey. Although deer do well in a pastureland-cropland mixture, they also do well in forest habitat. Clearing of large acreages of forestland will be detrimental to both game and non-game wildlife species.

There will be a detrimental impact of fishery habitat caused from clearing forestland. Such clearing will cause accelerated erosion and subsequent siltation of lakes, ponds, and streams in and below the cleared area. Off-site damages of this nature can be far removed from the cleared area.

Other uses as shown in table 9.7 include other lands, urban and built-up land, and small water. Other land is generally excellent upland game habitat. Ditch banks, fence rows, streambanks, spoil banks, roadside rights-of-way, and other such lands are included in the category. These are typically the "edge" habitats (ecotones) which are high quality wildlife habitat. In addition to being good habitat, these lands provide

safe travel corridors for terrestrial wildlife through hazardous open areas. The reduction in other lands of 26.1 thousand acres between 1970 and 1990 will have an adverse impact on wildlife resources.

Urban and built-up land will increase by 61.6 thousand acres between 1970 and 1990. This will be a detrimental impact on wildlife and fishery habitat. Some of the land converted for additional urban use will come from idle land and forestland. This conversion will eliminate habitat for wildlife.

Small water will increase by 11.4 thousand acres between 1970 and 1990. This is a beneficial impact. The development of small ponds creates more fishery habitat and adds diversity to the wildlife habitat of the surrounding area. Pond edges grow up into cover areas for wildlife, and the addition of such water can aid as a source of surface water during dry periods.

There is a large surplus of fishing waters in the basin. Any addition of large water can only cause a loss of wildlife habitat for unneeded fishery habitat. The lands converted to lakes will come largely from forestland, pastureland, or cropland, creating needs for these land uses that must be met elsewhere in the basin. This land use conversion creates an adverse impact on wildlife as valuable habitat will be lost.

Channel alterations, consisting primarily of channel clearing, are planned for 550 miles by 1990. This work will cause several adverse effects to fish and wildlife. Fish will be directly affected by loss of deeper pools, reduction in streamside vegetation that shades the water, and general shallowing of the water into a wider, shallower flow. Wildlife habitat is destroyed where channels are widened and excavated. This work also disrupts the movement of terrestrial wildlife along the wooded strip adjacent to many streams. The temporary loss of this streamside habitat and travel lane can be serious in open cropland and pastureland.

The installation of the structural measures to reduce flood damages will reduce seasonal flooding of 294.8 thousand acres of land. This will create an adverse impact on wintertime waterfowl habitat.

Selected conservation measures which can be installed through USDA programs will have a beneficial effect on the quantity and quality of wildlife habitat throughout the basin. Small watershed projects accelerate land treatment practices as a means of reducing erosion, flooding, and sedimentation. Many conservation practices will be installed through the early action watersheds and by farmers outside of active watershed projects with technical assistance being provided by the Soil Conservation Service. Important practices beneficial to wildlife are critical area planting, streambank stabilization, woodland stand improvement, tree planting, and installation of grade stabilization structures.

In summary, there will be:

1. Continued deterioration of bottomland hardwood resources and other forest types critically needed for forest game habitat.

2. A reduction in upland game habitat by conversion of idle land, other land, and pastured cropland into more harvested cropland, pastures, and urban areas, and the development of large water areas.

3. A possible increase in mourning dove populations due to increased production of harvested crops such as soybeans and small grains.

4. A reduction in habitat for squirrel, turkey, and other forest game.

5. Severe impacts to streamside habitat caused by planned work on 550 miles of channels.

6. An increase in conservation practices installed by landowners, with USDA assistance, that will be beneficial to wildlife.

Economic

The implementation of the early action suggested plan provides for benefits to increase the income to landowners and other basin residents. Also, a general increase in trade activity within the basin will occur. Monetary benefits were not estimated for land treatment measures, animal waste treatment units, and preservation of environmental elements. Benefits of the early action plan for the elements estimated amount to $7.3 million annually. Of this amount, $3.3 million are from flood prevention, $3.5 million from recreation benefits, and the remaining $479.0 thousand are from indirect activities associated with increased returns from flood prevention, recreation, and project construction. The early action plan provides for an average annual reduction in total flood damages of 47 percent in 19 watersheds.

The total installation cost of the early action suggested plan is $201.7 million. Jobs will be created to install the major plan elements--floodwater retarding structures, modification of channels, and land treatment measures. Additional jobs will result from the installation of the other plan elements. The operation and maintenance of the structures, land treatment, and other measures requires additional investments and creation of new jobs. Overall, the economy of the basin will benefit from the additional money put into circulation and from increased trade activity.

[Agriculture Production]

A comparison of agricultural production for the without plan situation and suggested plan situation in year 1990 indicates: cotton production will decrease from 53.6 to 44.8 thousand bales; soybean production will increase from 15.8 to 18.4 million bushels; corn production will increase from 2.6 to 3.4 million bushels; wheat production will decrease from 925.1 to 743.3 thousand bushels; hay production will increase from 299.2 to 432.9 thousand tons; pasture production will decrease from 4.7 to 3.4 million AUM's; and gross returns will increase from $102.2 to $108.4 million.

In year 2020 the comparison indicates: cotton production will increase from 25.6 to 71.2 thousand bales; soybean production will increase from 20.1 to 31.0 million bushels; corn production will increase from 3.3 to 8.2 million bushels; wheat production will increase from 5.0 to 6.2 million bushels; hay production will decrease from 215.7 to 65.2 thousand tons; pasture production will increase from 8.5 to 8.8 million AUM's; and gross returns will increase from $146.8 to $172.1 million.

[Forestry]

The impact on the economy resulting from the suggested plan implementation can be measured by several factors. The stumpage value of roundwood increases from $22.4 million in 1972 to $59.2 million in 2020. During this same period, forest industry employment increases from 18 thousand to 38 thousand. Although stumpage values and employment may be used to measure future economic conditions, value added by manufacturing is the most significant. Using value added, annual revenues from forest products will approach $596 million in 1990 and $887 million in 2020.

Land Use and Availability

Sufficient land of desirable quality is available to meet present and projected needs. However, some trends in land use merit particular attention. Historically, farmland has accounted for a majority of the land resources adaptable to farming pursuits--72 percent in 1954, 58 percent in 1959, 53 percent in 1964, and 47 percent in 1969. This trend indicates that more land is being converted to other uses--urbanization, roads, wildlife, recreation, timber company holdings, and water areas, among others. Timber company holdings account for the bulk of the change that has occurred without any planning.

The ability of basin farmers to maintain and increase their level of agricultural output is due primarily to increasingly efficient production methods. Nationwide, there has been a 50 percent increase in output per crop acre during the period 1949 to 1969. Contributing to the gain in output are more efficient farm organizations, increased irrigation and

use of agricultural chemicals, improvement in other farming inputs, development of more productive cropland, and retirement of less productive acreage. As indicated by the land use data in table 9.2, an increased level of output will accrue from a land base essentially unchanged from the situation existing in 1970.

Social and Institutional

Basin population is projected to increase from 456 thousand in 1970 to 717 thousand in 2020. The population increase will place additional pressure on basin resources and create needs for social well-being adjustments and institutional changes. Social considerations include improved educational facilities, health facilities, recreation facilities, services, cultural attractions, housing, and job opportunities.

The scaled down scope of the study precluded an evaluation and analysis of most social concerns. However, impacts related to employment and recreation are discernible.

The suggested plan will provide approximately two thousand permanent jobs during the period 1970 to 1990. Personal income will increase approximately $25 million annually.

The suggested plan recreational facilities will provide 2.4 million activity occasions annually. New facilities are scheduled to stay abreast of the demand generated by an increasing population. Preservation of natural areas, archaeological sites, and historic sites will supplement recreational, cultural, and educational opportunities of basin residents.

Many institutions--laws, practices, and contractural arrangements--and market forces interact to influence decisionmaking about use, ownership, and management of resources. Changes in existing institutions and new arrangements are sometimes necessary to achieve desired objectives. One such example is enactment of land use planning legislation by states. Local governments, mainly municipalities, have engaged in land use planning for many years; however, interest in land use planning on the state level is comparatively recent. Legislation has been introduced in Congress which would provide assistance to states in developing statewide land use planning processes and programs.

Citizen participation in setting objectives for land use and acceptance of measures to achieve these objectives is a vital concern. Many conflicts between public goals and private gain can arise as a result of resource decisions. Economic criteria alone cannot resolve these issues, even though economic considerations are often uppermost in basin and individual objectives for resource use.

Effectiveness to Meet Objectives and Component Needs

The problems of the basin resulted in the study concerns listed in Chapter III. These study concerns were then used to identify the specific components of the NED objective and the EQ objective (table 3.1). Component needs were identified to meet these objectives in Chapter VII. These needs were quantified for each objective and are obtainable within the limits of the basin resources. There may be some problems relating to financial matters and expansion of some programs. The implementation of the plan meets the objectives, as outlined, if the plan elements are installed. The overall effectiveness to meet objectives depends on the effectiveness of the plan to meet the component needs.

The ability of the suggested plan to meet the component needs for both objectives is portrayed by data presented in table 9.8. The plan is about 36 percent effective in reducing flood damages; 80 percent effective in meeting land treatment and management systems needs; 100 percent effective in meeting land needs, in providing recreation facilities, and in providing animal waste treatment units. Also, the plan reduces sediment yields from sub-basins by 36 percent. Further, the plan is about 100 percent effective in preserving the identified environmental elements (table 9.8).

Plan Effects Displays

As required by the Principles and Standards, the beneficial and adverse effects of the suggested early action plan are displayed in four accounts. These accounts are (1) national economic development, (2) environmental quality, (3) regional development, and (4) social well-being. Most of the data in the four accounts, except for social well-being, are presented for each of the nine sub-basins and for the basin.

Display 9.1--the national economic development account--presents the beneficial and adverse effects to the nation. Beneficial effects are identified as (1) the value to users of increased outputs of goods and services and (2) the net value of output resulting from external economies with a total value to the nation of $7.3 million annually. The value of resources required for the early action plan totals $5.0 million and are adverse effects. The net beneficial effects total $2.3 million annually. The effects to each sub-basin are displayed.

Display 9.2--the environmental quality account--reveals how the plan affects: areas of natural beauty; quality of water, land, and air; biological resources and selected ecosystems; and irreversible and irretrievable commitments of resources. The data are presented for each of the sub-basins for most items and for the basin for all items.

Table 9.8. Suggested plan effectiveness testing, Tombigbee River Basin, 1990 and 2020

Component needs	Units	Quantities needed		Plan			
				1990		2020	
		1990	2020	Provides	Remaining	Provides	Remaining
Flood damage reduction	Thou. ac.	690.6	690.6	294.8	395.8	454.3	236.3
	Thou. dol.	10,235.7	14,960.1	2,847.6	7,388.1	5,338.6	9,621.5
Wetness hazard damage reduction							
Cropland	Thou. ac.	553.3	586.8	442.6	110.7	469.4	117.4
Pastureland	Thou. ac.	418.3	360.8	334.7	83.6	288.0	72.8
Erosion damage reduction							
Critical areas							
Cropland	Thou. ac.	76.0	66.5	68.4	7.6	59.8	6.7
Pastureland	Thou. ac.	111.8	111.8	100.7	11.1	100.7	11.1
Forestland	Thou. ac.	77.5	77.5	62.0	15.5	62.0	15.5
Gully	Thou. ac.	27.9	27.9	25.1	2.8	25.1	2.8
Streambank	Miles	763.0	763.0	609.0	154.0	609.0	154.0
Strip mine	Thou. ac.	18.8	18.8	16.9	1.9	16.9	1.9
Roadside	Thou. ac.	10.8	10.8	9.7	1.1	9.7	1.1
Management systems							
Other areas							
Cropland	Thou. ac.	401.1	426.6	320.9	80.2	341.3	85.3
Pastureland	Thou. ac.	415.9	372.3	332.7	83.2	297.8	74.5
Forestland	Thou. ac.	2,268.2	2,268.2	1,814.6	453.6	1,814.6	453.6
Land							
Cropland	Thou. ac.	1,272.7	1,330.5	1,272.7	0.0	1,330.5	0.0
Pastureland	Thou. ac.	1,321.3	1,220.2	1,321.3	0.0	1,220.2	0.0
Forestland	Thou. ac.	5,665.0	5,635.0	5,665.0	0.0	5,635.0	0.0
Recreation							
Swimming beaches	Thou. act. occ.	1,380.0	1,855.6	1,394.6	0.0	1,864.3	0.0
Picnicking	Thou. act. occ.	1,691.5	2,608.2	1,691.2	0.3	2,605.0	3.2
Camping	Thou. act. occ.	465.1	618.0	458.1	7.0	621.0	0.0
Hunting	Thou. man-days	0.0	391.5	0.0	0.0	400.0	0.0
Sediment yield reduction from sub-basins	Thou. tons	13,266.0	13,562.0	4,522.0	8,744.0	4,996.0	8,566.0
Animal waste treatment units	Numbers	552.0	594.0	552.0	0.0	594.0	0.0
Preserve environmental elements							
Natural and scenic	Numbers	57.0	64.0	29.0	28.0	51.0	13.0
Ecological communities	Numbers	6.0	6.0	6.0	0.0	6.0	0.0
Archaeological sites	Numbers	452.0	484.0	440.0	12.0	480.0	4.0
Historic sites	Numbers	31.0	36.0	31.0	0.0	36.0	0.0

Source: River Basin Survey Staff, United States Department of Agriculture.

DISPLAY 9.1

SUGGESTED EARLY ACTION PLAN, TOMBIGBEE RIVER BASIN, 1990

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

Components	Measure of effects: Sub-basin number: 34 Upper	34 Lower	34a	34b	34c	34d	34e	34f	34h	Basin total
	(Average annual thousand dollars)									
Beneficial effects:										
A. The value to users of increased outputs of goods and services.										
1. Flood prevention	771.7	86.1	869.6	248.4	0	547.8	0	753.2	52.4	3,329.2
2. Recreation	804.6	549.0	436.5	187.8	220.3	366.7	209.3	537.4	228.1	3,539.7
3. Utilization of unemployment and underemployed labor resources										
a. Project construction	120.5	26.4	103.3	29.0	6.8	65.9	5.4	107.5	14.5	479.3
Total beneficial effects	1,696.8	661.5	1,409.4	465.2	227.1	980.4	214.7	1,398.1	295.0	7,348.2
Adverse effects:										
A. The value of resources required for a plan.										
1. Floodwater retarding structures, channels and recreation facilities:										
a. Project installation	938.5	168.8	820.9	223.4	34.0	524.6	27.3	865.0	99.1	3,701.6
b. OM&R	304.0	197.6	199.9	86.1	83.0	126.2	66.7	174.2	85.4	1,323.1
Total adverse effects	1,242.5	366.4	1,020.8	309.5	117.0	650.8	94.0	1,039.2	184.5	5,024.7
Net beneficial effects	454.3	295.1	388.6	155.7	110.1	329.6	120.7	358.9	110.5	2,323.5

Source: River Basin Staff, United States Department of Agriculture.

1/ One hundred years @ 6 1/8 percent interest.

2/ Land treatment, animal waste, and preservation of environmental elements effects were not evaluated. Land treatment installation costs total $127.2 million with an annual cost of $24.4 million; animal waste installation costs total $2.8 million with an annual cost of $583.4 thousand; and preservation of environmental elements installation costs total $11.5 million with an annual cost of $919.3 thousand.

DISPLAY 9.2

SUGGESTED EARLY ACTION PLAN, 1990

ENVIRONMENTAL QUALITY ACCOUNT

Components		Item	Unit	Measure of effects: Sub-basin: 34 Upper	34 Lower	34a	34b	34c	34d	34e	34f	34h	Basin total
Beneficial and adverse effects:													
A. Areas of natural beauty	1.	Improve the aesthetic quality by flood protection.	Thous. acres	71.9	4.1	74.6	17.3	0	47.3	0	75.5	4.1	294.8
	2.	Loss of bottomland hardwoods along planned channel alterations.	Acres	2,325	0	1,245	100	0	315	0	1,950	120	6,055
	3.	Create primarily large water impoundments.	Acres	3,010	175	2,290	600	0	1,475	0	3,600	250	11,400
	4.	Inundate forest and stream bottoms	Acres	1,200	110	850	110	0	280	0	1,400	190	4,140
	5.	Disruption of streamside vegetation along streams to be altered.	Miles	152	0	118	52	0	89	0	131	8	550
	6.	Permanent loss of vegetation to channels.	Acres	185	0	170	40	0	85	0	130	10	620
	7.	Reduce erosion.	Thous. acres	438.7	860.0	267.3	162.1	241.9	117.5	234.3	222.0	207.2	2,751.0
	8.	Improve aesthetic quality of streams by streambank stabilization.	Miles	76	166	43	57	38	82	22	101	24	609
	9.	Preservation of natural and scenic areas, archaeological sites, and historic sites.	Number										29
			Number										440
			Number	Not determined on a sub-basin basis									31
B. Quality considerations of water, land, and air.	1.	Storage of sediment behind dams.	Thous. ac.-ft.	30.4	1.0	19.5	3.9	0	7.1	1.8	25.5	1.8	91.0
	2.	Reduce sediment yield.	Thous. tons	1,645.0	1,055.0	355.0	68.0	256.0	155.0	240.0	525.0	240.0	4,522.0
	3.	Temporary disruption of streamside vegetation on channels to be altered.	Miles	152	0	118	52	0	89	0	131	8	550
	4.	Reduce erosion	Thous. acres	438.7	860.0	267.3	162.1	241.9	117.5	234.3	222.0	207.2	2,751.0
	5.	Improve quality of lands and waters by flood damage reduction.	Thous. acres.	71.9	4.1	74.6	17.3	0	47.3	0	75.5	4.1	294.8
	6.	Improve water and land resource by stabilization of streambanks.	Miles	76	166	43	57	38	82	22	101	24	609
	7.	Creation of lakes in place of forest, pasture, and cropland.	Acres	3,010	175	2,290	600	0	1,475	0	3,600	250	11,400
	8.	Reduce agricultural pollution by installing animal waste treatment units.	Number	155	74	71	30	30	83	26	66	17	552

Continued---

DISPLAY 9.2

SUGGESTED EARLY ACTION PLAN, 1990 (continued)

ENVIRONMENTAL QUALITY ACCOUNT

Components	Item	Unit	Measure of effects: Sub-basin: 34 Upper	34 Lower	34a	34b	34c	34d	34e	34f	34h	Basin total
Beneficial and adverse effects:												
C. Biological resources and selected ecosystems.	1. Create flatwater fish habitat.	Acres	3,010	175	2,290	600	0	1,475	0	3,600	250	11,400
	2. Provide resting area for migratory waterfowl.	Acres	3,010	175	2,290	600	0	1,475	0	3,600	250	11,400
	3. Inundate good wildlife habitat of bottomland hardwoods and upland	Acres	857	83	606	80	0	192	0	1,100	130	3,048
	timberlands.	Acres	343	27	244	30	0	88	0	300	60	1,092
	4. Improve wildlife habitat by providing watering places and additional edge cover.	Number	55	5	68	17	0	31	0	49	6	231
	5. Restricted wildlife habitat in bottomland hardwoods and upland timber-	Acres	990	90	1,240	120	0	400	0	1,400	70	4,310
	land in flood pools.	Acres	1,330	115	1,235	70	0	205	0	1,800	200	4,955
	6. Reduce quality of wildlife habitat in bottomland hardwoods along planned channel alterations.	Acres	2,325	0	1,245	100	0	315	0	1,950	120	6,055
	7. Reduced overwintering waterfowl habitat now protected from flooding.	Thous. acres	71.9	4.1	74.6	17.3	0	47.3	0	75.5	4.1	294.8
	8. Preserve ecological communities.	Number	Not determined on a sub-basin basis									6
D. Irreversible and irretrievable commitments of resources:	1. Conversion of bottomland hardwoods, upland timberland, and cropland and pasture into reservoir	Acres	857	83	606	80	0	192	0	1,100	130	3,048
	pools.	Acres	343	27	244	30	0	88	0	300	60	1,092
		Acres	1,810	65	1,440	490	0	1,195	0	2,200	60	7,260
	2. Loss of land to channels.	Acres	185	0	170	40	0	85	0	130	10	620

Source: River Basin Survey Staff, United States Department of Agriculture.

Display 9.3--the regional development account--provides the effects of the early action plan to Alabama and Mississippi and to the rest of the nation. The beneficial and adverse effects on income and employment are displayed. The data are presented for each sub-basin and for the basin. The total beneficial effects of the early action plan to the states are $9.1 million annually and minus $456.0 thousand annually to the nation. The adverse effects are $2.4 million for the states and as $2.7 million for the nation and represent the value of the resources necessary to achieve the outputs of the plan. The net beneficial effects to the states total $6.7 million and a minus $3.1 million to the nation.

The impacts on employment in Alabama and Mississippi are also displayed by sub-basin and for the basin. Jobs are created as the result of the plan and some jobs are lost. The net beneficial effects of the plan creates 1,877 permanent semi-skilled jobs and 1,206 man-years of labor in construction of plan elements.

Display 9.4--the social well-being account--presents the beneficial and adverse effects relating to: real income distribution; life, health, and safety; and recreational opportunities. The data are presented only for the basin.

Comparison to Other Alternative Plans

The ability to meet the objectives of the study and to provide plan elements to meet the component needs established during the study determines the effectiveness of the plan. The effectiveness was discussed previously.

The capability of alternative plans to satisfy component needs is exemplified in table 8.12. Component needs are quantified for 1990 and 2020. The quantities provided by each plan and the quantities remaining are presented. Data are presented for three plans--NED, EQ, and A. Table 9.8 shows the effectiveness of the suggested plan.

Another meaningful comparison is the beneficial and adverse effects of each plan as displayed in the four accounts. A summary comparison between the suggested early action plan and other alternative early action plans is presented in table 9.9.

As displayed in table 9.9, the suggested plan provides a net beneficial effect to the national economic efficiency that is larger than the alternative plans. The suggested plan creates fewer acres of water and provides for flood protection on fewer acres than provided by the alternative plans. Also, the suggested plan's net beneficial effects to the states of Alabama and Mississippi are smaller for the NED and the A plan and greater for the EQ plan. Fewer jobs are provided for by the suggested plan than provided by the NED and A alternatives. Refer to the table for more details.

DISPLAY 9.3

SUGGESTED EARLY ACTION PLAN, TOMBIGBEE RIVER BASIN, 1990

REGIONAL DEVELOPMENT ACCOUNT

Components	Measure of effects: Sub-basin number: 34 Upper: Ala. and Miss.	34 Upper: Rest of nation	34 Lower: Ala. and Miss.	34 Lower: Rest of nation	34a: Ala. and Miss.	34a: Rest of nation	34b: Miss.	34b: Rest of nation	34c: Ala. and Miss.	34c: Rest of nation
	Thousand dollars - average annual 1/ 2/									
Income:										
Beneficial effects:										
A. The value of increased output of goods and services to users residing in the basin.										
1. Flood prevention	771.7	0	86.1	0	869.6	0	248.4	0	0	0
2. Recreation	804.6	0	549.0	0	436.5	0	178.8	0	220.3	0
3. Utilization of unemployed and underemployed labor resources										
a. Project construction	120.5	0	26.4	0	103.3	0	29.0	0	6.8	0
4. Additional wages and salaries accruing to the basin from implementation of the plan										
a. Project OM&R (structures)	2.9	- 2.9	.4	- .4	2.5	- 2.5	0 8	- 0.8	0	0
b. Recreation service sector	51.9	- 51.9	40.6	- 40.6	31.6	- 31.6	14.8	- 14.8	18.0	-18.0
B. The net value of output to users residing in the basin from external economics.										
1. Net indirect activities associated with increased net returns from flood prevention and recreation	315.2	0	127.0	0	173.9	0	49.7	0	44.0	0
2. Net indirect and induced activities associated with utilization of regional unemployed and underemployed and other labor resources										
a. Farm hired labor	36.1	- 36.1	4.0	- 4.0	40.7	- 40.7	11.6	- 11.6	0	0
b. Recreation service sector	10.4	- 10.4	8.1	- 8.1	6.3	- 6.3	3.0	- 3.0	3.6	- 3.6
c. Project OM&R	2.2	- 2.2	.3	- .3	1.9	- 1.9	0.6	- 0.6	0	0
Total beneficial effects	2,115.5	-103.5	841.9	- 53.4	1,666.3	- 83.0	545.7	- 30.8	292.7	-21.6
Adverse effects:										
A. The value of resources contributed from within the basin to achieve the outputs.										
1. Floodwater retarding structures and recreation activities:										
a. Projection installation	261.2	677.3	47.0	121.8	228.5	592.4	62.2	161.2	9.5	24.5
b. OM&R	304.0	0	197.6	0	199.9	0	86.1	0	83.0	0
Total adverse effects	565.2	677.3	244.6	121.8	428.4	592.4	148.3	161.2	92.5	24.5
Net beneficial effects	1,550.3	-780.8	597.3	-175.2	1,237.9	-675.4	397.4	-192.0	200.2	-46.1

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DISPLAY 9.3

SUGGESTED EARLY ACTION PLAN, TOMBIGBEE RIVER BASIN, 1990 (Continued)

REGIONAL DEVELOPMENT ACCOUNT

Components	Measure of effects									
	Sub-basin number								Basin total	
	34d		34e		34f		34h			
	Miss.	Rest of nation	Ala.	Rest of nation	Ala. and Miss.	Rest of nation	Ala. and Miss.	Rest of nation	Ala. and Miss.	Rest of nation
	Thousand dollars - average annual 1/ 2/									
Income:										
Beneficial effects:										
A. The value of increased output of goods and services to users residing in the basin.										
1. Flood prevention	547.8	0	0	0	753.2	0	52.4	0	3,329.2	0
2. Recreation	366.7	0	209.3	0	537.4	0	228.1	0	3,539.7	0
3. Utilization of unemployed and underemployed labor resources										
a. Project construction	65.9	0	5.4	0	107.5	0	14.5	0	479.3	0
4. Additional wages and salaries accruing to the basin from implementation of the plan.										
a. Project OM&R (structures)	1.5	- 1.5	0	0	2.7	- 2.7	0.2	- 0.2	11.0	- 11.0
b. Recreation service sector	20.1	- 20.1	14.5	-14.5	24.6	- 24.6	17.5	-17.5	233.6	- 233.6
B. The net value of output to users residing in the basin from external economics.										
1. Net indirect activities associated with increased net returns from flood prevention and recreation	182.9	0	41.9	0	258.1	0	56.1	0	1,248.8	0
2. Net indirect and induced activities associated with utilization of regional unemployed and underemployed and other labor resources										
a. Farm hired labor	25.6	- 25.6	0	0	35.2	- 35.2	2.6	- 2.6	155.8	- 155.8
b. Recreation service sector	4.0	- 4.0	2.9	- 2.9	4.9	- 4.9	3.5	- 3.5	46.7	- 46.7
c. Project OM&R	1.2	- 1.2	0	0	2.1	- 2.1	0.2	- 0.2	8.5	- 8.5
Total beneficial effects	1,215.7	- 52.4	274.0	-17.4	1,725.7	- 69.5	375.1	-24.0	9,052.6	- 455.6
Adverse effects:										
A. The value of resources contributed from within the basin to achieve the outputs.										
1. Floodwater retarding structures and recreation activities:										
a. Project installation	146.0	378.6	7.6	19.7	240.7	624.3	27.6	71.5	1,030.3	2,671.3
b. OM&R	126.2	0	66.7	0	174.2	0	85.4	0	1,323.1	0
Total adverse effects	272.2	378.6	74.3	19.7	414.9	624.3	113.0	71.5	2,353.4	2,671.3
Net beneficial effects	943.5	-431.0	199.7	-37.1	1,310.8	-693.8	262.1	-95.5	6,699.2	-3,126.9

continued----

DISPLAY 9.3

SUGGESTED EARLY ACTION PLAN, TOMBIGBEE RIVER BASIN, 1990 (Continued)

REGIONAL DEVELOPMENT ACCOUNT

Components	Measure of effects: Sub-basin number: 34 Upper Ala. and Miss.	34 Lower Ala. and Miss.	34a Ala. and Miss.	34b Miss.	34c Ala. and Miss.	34d Miss.	34e Ala.	34f Ala. and Miss.	34h Ala. and Miss.	Basin total: Alabama and Mississippi	Basin total: Rest of nation
Employment:											
Beneficial effects:											
A. Increase in the number of types of jobs.											
1. Agricultural employment	278	31	313	89	0	197	0	271	19	1. Create 1,198 permanent jobs in agricultural production	--
2. Employment in recreation	122	82	65	28	33	55	31	81	34	2. Create 531 permanent jobs in recreation	--
3. Employment in construction	319	52	267	71	11	163	15	276	32	3. Create 1,206 man-years of labor for one year	--
4. Employment in project OM&R	19	13	13	6	5	8	4	11	6	4. Create 85 permanent jobs in operation and maintenance	--
5. Indirect and induced employment for project installation and output of project goods and services	47	19	26	7	7	27	6	39	8	5. Create 186 permanent semi-skilled jobs from indirect and induced employment	--
Total beneficial effects	466	145	417	130	45	287	41	402	67	Create 2,000 permanent semi-skilled jobs	
	319	52	267	71	11	163	15	276	32	Create 1,206 man-years of labor in construction	
Adverse effects:											
A. Decrease in number and types of jobs.											
1. Lost in agricultural employment of project take area	26	3	24	6	0	15	0	26	2	1. 102 permanent semi-skilled jobs in agricultural employment	--
2. Lost in indirect and induced employment associated with project take area	6	1	5	1	0	3	0	5	0	2. 21 permanent semi-skilled jobs	--
Total adverse effects	32	4	29	7	0	18	0	31	2	Lose 123 permanent semi-skilled jobs	--
Net beneficial effects	434	141	388	123	45	269	41	371	65	Create 1,877 permanent semi-skilled jobs	--
	319	52	267	71	11	163	15	276	32	Create 1,206 man-years of labor in construction	--

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ 100 years at 6 1/8 percent interest.
2/ Land treatment, animal waste, and preservation of environmental elements effects were not evaluated.

DISPLAY 9.4

SELECTED EARLY ACTION PLAN, 1990

SOCIAL WELL-BEING ACCOUNT

Components	Measures of effects
Beneficial and adverse effects:	
A. Real income distribution.	1. Create 2,000 low to medium income permanent jobs for area residents.
	2. The net monetary benefit of $9,052,600 will provide opportunity to improve the income of about 28% of the families in the basin where incomes are below the poverty level.
B. Life, health, and safety.	1. Increased output will be in soybeans, wheat, and livestock products.
	2. Reduce flood damages on 294.8 thousand acres.
C. Recreational opportunities.	1. Create 2.4 million recreation days primarily for a rural farm population.

Source: River Basin Staff, United States Department of Agriculture.

Table 9.9. Summary comparison between the suggested early action plan and other alternative early action plans, Tombigbee River Basin, 1990 1/

Accounts	Unit	Alternatives			Suggested Plan	Difference (Suggested Plan minus alternatives shown)		
		NED Plan	EQ Plan	Plan A		NED Plan	EQ Plan	Plan A
1. National economic efficiency								
Beneficial effects	Dollars	9,763.1	5,875.3	7,993.4	7,348.2	-2,414.9	1,472.9	-645.2
Adverse effects	Dollars	7,609.2	4,479.9	6,043.4	5,024.7	-2,584.5	544.8	1,018.7
Net beneficial effect 2/	Dollars	2,153.9	1,395.4	1,950.0	2,323.5	169.6	928.1	373.5
2. Environmental quality								
Beneficial and adverse effects								
A. Create lakes - for national beauty and creation, and improvement of fish and wildlife habitat.	Surface acres	16,590	13,040	16,590	11,400	-5,190	-1,640	-5,190
B. Reduce erosion - for quality considerations of water and land and for national beauty.	Acres	2,741,300	2,761,800	2,751,000	2,751,000	9,700	10,800	0
C. Loss of bottomland hardwoods - decrease in wildlife habitat and national beauty.	Acres	24,685	5,085	14,535	9,103	-15,582	4,018	-5,432
D. Reduce flooding - for aesthetic quality and improved quality of land and water.	Acres	395,300	378,600	395,300	294,800	-100,500	-83,800	-100,500
E. Conversion of terrestrial land use to water.	Acres	16,590	13,040	16,590	11,400	-5,190	-1,640	-5,190
3. Regional development - States of Alabama and Mississippi								
A. Income:								
Beneficial effects	Dollars	12,126.4	7,415.3	9,952.1	9,052.6	-3,073.8	1,637.3	-899.5
Adverse effects	Dollars	3,244.1	2,004.5	2,688.0	2,353.4	-890.7	348.9	-334.6
Net beneficial effects	Dollars	8,882.3	5,410.8	7,264.1	6,699.2	-2,183.1	1,288.4	-564.9
B. Employment:								
Net beneficial effects								
Permanent semi-skilled jobs	Number	2,651	1,254	2,071	1,877	-774	623	-194
Man-years of labor in construction	Number	1,922	1,042	1,474	1,206	-716	164	-268
4. Social well-being								
A. Provide low to medium income permanent jobs	Number	2,864	1,417	2,230	2,000	-864	583	-230
B. Reduce flood damages	Acres	395,300	378,600	395,300	294,800	-100,500	-83,800	-100,500
C. Provide recreational opportunities - visitor days	Number	2,400,000	2,400,000	2,400,000	2,400,000	0	0	0

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ Monetary values are in average annual thousands.
2/ Considering the total plan, early action and long range, the NED plan provides the most net benefits.

CHAPTER X

IMPLEMENTATION PROGRAMS

United States Department of Agriculture

Many USDA programs exist that will provide technical and financial assistance to state and local sponsors and basin residents in implementing the suggested plan. Each of the components of the study and the various programs that are available for assistance are discussed below.

Flood Damage Reduction

The USDA programs to provide the plan elements to reduce flood damages are the small watershed program or Public Law 566 (Watershed Protection and Flood Prevention Act) and the Food and Agriculture Act of 1962 (Public Law 87-703) that provides assistance through the Resource Conservation and Development (RC&D) Program. The flood hazard analysis program, Section 6 of PL 566 also provides means to reduce flood damages.

As outlined in Chapter VII, a need exists for a watershed program to reduce flood damages in 33 watersheds (map 7.1). The suggested plan includes 26 of the 33 watersheds. The early action plan includes 19 of these watersheds, and they are identified on map 9.1. Before the plan elements can be installed, each individual watershed must be planned according to the guidelines required for these small watershed projects. During the detailed planning, which requires a local sponsor and also results in a watershed work plan to present the plan elements that will be installed, public participation is required. Economic, social, and environmental aspects of alternative plans must be considered during planning.

Two RC&D project plans that cover a part of the basin are also available to reduce flood damages. The Northeast Mississippi RC&D Project and the Tombigbee RC&D Project in Alabama both include project measures that when planned and installed will reduce flood damages. Some of these project measures are located in areas outside of the 26 watersheds and provide a program to reduce flooding in small communities and towns and also in agricultural areas. No attempt was made to quantify this potential reduction in flood damages by the RC&D project measures. Overall, the total area involved and the damage reduction would be small when compared to the basin's total problem.

The Farmers Home Administration (FmHA) can make loans to local sponsors to assist in implementing flood prevention projects. Loans are used to finance the local cost-sharing items as required by the individual projects.

Wetness Hazard Damage Reduction

These plan elements are land treatment measures on cropland and pastureland or associated treatment measures to make the project structural measures effective. USDA programs are available to accomplish this task but local costs are involved.

The regular program of the Soil Conservation Service (Public Law 46) can provide technical assistance through the local Soil Conservation Districts for planning and installing land treatment measures. An acceleration of this technical assistance is available for watersheds planned under Public Law 566 and for areas where project measures are planned in the RC&D project areas.

Cost-sharing for installing some of the plan elements are available through the Agricultural Stabilization and Conservation Service where the county committees have an applicable program.

Erosion Damage Reduction - Critical Areas

The USDA programs for the treatment of critical areas include providing technical assistance for all items and cost-sharing on other items. As for most of the other plan elements, an acceleration of services occurs when a watershed is planned under PL 566 or a project measure is planned in the RC&D project areas. The Soil Conservation Service and U.S. Forest Service have the major responsibilities for planning and installing these projects. Local landowners or sponsors are responsible for operating and maintaining the installed measures.

As many of the needed plan elements are in sub-basins or areas not located in the watersheds recommended for project action or in RC&D project areas, the treatment of critical areas is limited to the technical assistance provided by the local Soil Conservation Districts (Public Law 46). Where the ASCS has county programs that cover these treatment measures, financial assistance is available.

Additional authorization to allow acceleration of technical assistance and cost-sharing for installation is recommended. One method could be to include the area not presently in an RC&D project area into an RC&D project. Another method could be the formation of a legally organized local sponsor for a sub-basin, several counties, or a county and prepare a land treatment plan for the entire area.

Management Systems - Other Areas

USDA programs for providing assistance for the installation of management systems are the same as for critical areas. Programs available include (1) those that provide technical assistance from the Soil Conservation

Service and U.S. Forest Service to landowners in planning the various management systems and (2) those that provide for cost-sharing through the ASCS county programs, where available. Where the problem areas are located in PL 566 watersheds and RC&D measure plan areas, these services are accelerated.

[Cooperative State and Private Forestry Programs]

These programs are associated with the U.S. Forest Service. They provide means to intensify forest management to increase stocking of forest stands through tree planting and timber stand improvement. In addition, they provide an incentive to and training of individuals to increase utilization of roundwood.

The Forest Incentives Program (FIP), established under the Agricultural and Environmental Consumers Protection Act of 1973, Public Law 93-86, can provide the thrust necessary to increase management of private forestlands. The ASCS administers the program in cooperation with the U.S. Forest Service and state forestry commissions. The commissions provide the implementation leadership. This is a cost-shared program.

Other U.S. Forest Service programs that provide assistance are Cooperative Forest Management (CFM), Tree Seedling Production (CM-4), Forest Products Utilization (FPU), and General Forestry Assistance (GFA). In addition, U.S. Forest Service research programs make technology available to increase utilization of wood products.

Animal Waste Treatment

The USDA programs provide technical assistance to operators and landowners that confine animals in such a manner that waste must be controlled. Generally, the assistance is aimed at the small operator or landowner through the Soil Conservation District program. Cost-sharing may be provided by the ASCS where the county committee includes such a practice.

Recreation

Programs of the USDA are presently available for use by local sponsors to increase the recreation facilities of the basin. Provisions of the Watershed Protection and Flood Prevention Act (Public Law 566) include multipurpose reservoirs, including water storage for recreation purposes. Along with the water storage, recreation facilities can be installed. Cost-sharing for these facilities is available. These facilities may be included in any watershed planned under the Act with restrictions as included in the law. No attempt was made to determine how many of the facilities would be provided by this method.

The project measures proposed by the two RC&D project areas that include a large part of the basin include measures for adding to the recreation resources of the basin. These measures must be planned within the guidelines of the law. Also, all project measures must have a local sponsor for cost-sharing and for operating and maintaining the facilities after installation. Both the small watershed projects (PL 566) and the project measures included in RC&D project plans provide excellent means of meeting the recreation needs of the basin.

The plan element that will improve the wildlife population of the basin is mostly a land treatment practice for installing measures that support additional wildlife in a given area. The USDA program is one that provides technical assistance. This assistance may be provided through the Soil Conservation Districts by the Soil Conservation Service and the U.S. Forest Service.

Preservation of Environmental Elements

The USDA programs do not provide many opportunities for the preservation of the basin's environmental elements. However, one requirement for all technical and financial assistance for any measure under the USDA program is that no known archaeological, historical, and scenic sites be destroyed. In fact, during the planning of any projects under PL 566 or the RC&D program, a study must be included by experts in the field to insure that no archaeological or historical sites will be affected. Where it is found that such sites are involved, they must be fully investigated to determine their value before planning can be completed.

The RC&D project plans include project measures that provide for development of historic or scenic sites by installing overlooks and markers for the sites.

Environmental Impacts of USDA Portion of the Plan

Environmental Impacts

The probable impacts of USDA programs were described in Chapter IX. Land treatment impacts primarily deal with erosion damage reduction measures and protection of the land base. Other land treatment measures pertain to forest management systems, cropland management systems, and pasture management systems. A breakdown of individual land treatment measures is presented in table 9.3. Structural measures creating environmental impacts include floodwater retarding structures, channel modification, and combinations of floodwater retarding structures and channels (see table 9.3).

Display 9.2 gives expected major impacts to the environment for the suggested plan by 1990.

Favorable Environmental Impacts

Under the NED account, average annual beneficial effects are $7.3 million, adverse effects are $5.0 million, creating a net average annual beneficial effect of $2.3 million. Environmental quality effects are those that primarily deal with changes in land use, directly or indirectly, and those associated with a reduction of flood damages and erosion and sediment damages.

A comparison of suggested plan land use (table 9.2) with land use for without plan conditions provides an idea of the value of the plan to components of the EQ objective. Because of improved agricultural production efficiency with the plan, cropland acreage will be reduced from 1.4 million acres in 1990 to 1.3 million acres, pastureland from 1.4 million acres to 1.3 million acres, and forestland will increase from 5.5 million acres to 5.7 million acres. Additional changes in the same direction will result in 2020. Quantities of wildlife-environmental areas will actually be increased through lesser utilization of land resources for cropland and pastureland under with plan conditions.

Major beneficial effects are 91.0 thousand acre-feet of trapped sediment; a reduction of 4.6 million tons of sediment yield; erosion reduction on 2.8 million acres; flood protection on 294.8 thousand acres; and reduction of pollution by installation of 552 animal waste treatment units.

Adverse Environmental Effects

Major adverse effects are primarily those that reduce the quality or quantity of wildlife environmental areas. Such impacts are: loss of bottomland hardwoods on 6.1 thousand acres along planned channel alterations; inundation of 11.4 thousand acres of forest, pasture and cropland; and disruption of vegetation adjacent to 550 miles of streams to be altered.

Implementation of suggested plan elements will cause several unavoidable adverse environmental effects. There will be a loss of 6.1 thousand acres of bottomland hardwood forest along planned channel alterations. Construction of flood control reservoirs will inundate 11.4 thousand acres of forest, pasture, and cropland. Stream alteration will temporarily disrupt vegetation along 550 miles. Construction of channels will take 620 acres of land. Waterfowl habitat will be reduced on 294.8 thousand acres as bottomlands are protected from periodic flooding.

Alternatives

Three alternative plans were formulated--NED, EQ and A. All plans provide for flood damage plan elements; however, only plans NED and A provide for an effective flood damage reduction in 23 watersheds by 1990.

Major land uses for the NED and A plans are identical. Fewer acres of land with wetness hazard would receive treatment under the EQ plan. Plans A and EQ include elements to reduce pollution from animal waste.

Impacts to the environment would be greater under the NED plan, whereas environmental impacts would be less under the EQ plan. The suggested plan seeks to balance unavoidable environmental losses from USDA programs with offsetting gains to the basin's populace.

Short-term and Long-term Use of Resources

Implementation of USDA plan elements will insure more effective utilization of lands. Trends in land use changes to achieve more effective utilization will accelerate as projects are installed. As flooding problems are solved in local watersheds, short-term gains in agricultural outputs will be realized with a concomitant increase in environmental losses and problems due to agricultural endeavors. Long-term erosion and sediment reduction goals may or may not be met depending on the care given to agricultural growth areas by landowners.

If implementation of USDA elements causes environmental losses or encourages individuals to clear land or cause environmental damage, these actions may satisfy local needs at the expense of long-term national goals of resource utilization.

Irreversible or Irretrievable Commitments of Resources

There will be an irreversible or irretrievable commitment of 12.0 thousand acres of land. Forestland, pastureland, and cropland will be converted to other land uses and lands will be lost in reservoir pools and in channels. The construction of structural measures commits materials and other resources to the various plan elements.

Programs Other Than USDA

Programs other than those of the United States Department of Agriculture are available to assist state and local sponsors and basin residents in implementing parts of the suggested plan. Each of the components of the study and the programs available for assistance are discussed below.

Flood Damage Reduction

Other federal agencies that have programs to reduce flood damages are the Corps of Engineers and the Federal Insurance Administration (FIA), an agency of the United States Department of Housing and Urban Development (HUD). The Corps of Engineers has an active program in the basin as discussed in Chapter V. The Tombigbee River and Tributaries project is in various levels of development and affects upstream projects for flood damage reduction. Some projects have been completed; others are being constructed, while others are being restudied. These Corps of Engineers projects are primarily on the principal streams. Close coordination between the Corps of Engineers and the Soil Conservation Service in the final planning and installation is necessary to realize an effective project. In some instances where the Corps of Engineers projects are de-authorized, upstream projects may have to be modified.

The installation of the Tennessee-Tombigbee Waterway by the Corps of Engineers will also affect some of the upstream flood prevention projects. Where these upstream projects outlet directly into the waterway, full coordination is necessary to insure that the projects are effective in reducing flood damages.

The National Flood Insurance Program, administered by the FIA, will eventually make flood insurance available throughout the nation. Federal agencies such as Corps of Engineers, Soil Conservation Service, and United States Geological Survey, all make flood hazard studies to assist the FIA with this program. Also, engineering firms make flood hazard studies. The overall priority for where the studies are made rests with a state coordinating agency. In Alabama, the Alabama Development Office sets priorities; in Mississippi, the Research and Development Center.

State and local agencies that have a part in reducing flood damages by setting priorities, sponsoring projects or providing financial assistance are listed below:

Alabama

Alabama Development Office.
Soil and Water Conservation Districts.
Water Management or Drainage Districts.
State Soil and Water Conservation Committee.
Watershed Conservancy Districts.

Mississippi

Mississippi Board of Water Commissioners.
Tombigbee River Valley Water Management District.
Soil and Water Conservation Districts.
Water Management or Drainage Districts.
State Soil and Water Conservation Committee.

Wetness Hazard Damage Reduction

The local Soil Conservation Districts and the local sponsors of watershed projects or RC&D project measures provide technical assistance to landowners or groups of landowners to reduce damages to cropland and pastureland. Costs of installing and maintaining the measures are usually borne by the landowners. However, cost-sharing may be available through the ASCS county programs.

Erosion Damage Reduction

The Water Pollution Control Act Amendments of 1972 (PL 92-500), administered by the Environmental Protection Agency (EPA), contains sections that affect the entire nation. Section 404 of the Act, administered by the Corps of Engineers, requires dredge and fill permits for any work that affects the "waters of the United States" and adjacent wetlands.

Section 208 of the Act includes authority for the EPA to require that studies be made on an area basis relating to the non-point sources of pollution, generally sediment and related non-point pollution. This program is just starting in most states. The state and local Soil Conservation Districts and the state agencies that control air and water quality, all will have major inputs. The Mississippi Air and Water Pollution Control Commission and the Alabama State Department of Public Health, especially the Alabama Water Improvement Commission and the Air Pollution Control Commission, are the primary state agencies involved.

All federal agencies are required to comply with the laws that prevent any pollution from occurring as the result of any construction projects of these agencies. This also includes highway construction.

The local Soil Conservation Districts of Alabama and Mississippi provide technical assistance to landowners and others on how to keep erosion hazards to a minimum. Also, the local water management districts, drainage districts or watershed conservancy districts provide assistance by sponsoring projects that include erosion control. As stated previously, landowners still must bear the responsibility for keeping erosion and the resulting sediment yields to a minimum. Where county committees have programs, cost-sharing by ASCS may be available.

Local and state forestry agencies also provide technical assistance to manage and reduce erosion potential from forestland. The Alabama Forestry Commission and the Mississippi Forestry Commission both have programs for forest resource development and protection and an information and education program.

The Forest Incentives Program has produced strong accomplishments since its recent inception. This program requires forest management plans on private ownerships. The goal is 100 percent participation by the year 2000.

Animal Waste Treatment

The National Pollution Discharge Elimination System (NPDES) regulations for concentrated animal feeding operations was published in the Federal Register on March 18, 1976 by the EPA. Permits are required for certain size confined animal units. These regulations also establish conditions under which feedlots and storm sewers are considered point sources of pollution subject to NPDES permit requirements.

Recreation

Many federal, state, and local agencies have programs on ways in which assistance may be provided to increase the recreation facilities of the basin. One of the major impacts on the recreation resources will be the Tennessee-Tombigbee Waterway Project. In conjunction with this project will be many recreation facilities. This study did not identify the facilities along the lakes included in the project being installed by the Corps of Engineers. The Bureau of Outdoor Recreation and U. S. Fish and Wildlife Service of the Department of the Interior cost-share under some of its programs to develop land and water for recreation and parks. Grants are made to state agencies, among other assistance.

The following state agencies have responsibilities or programs that can be used to improve the recreation facilities of the basin.

Alabama

Alabama Department of Conservation and Natural Resources.
1. Game and Fish Division.
2. Lands Division.
3. Parks Division.

State Health and Environmental Service.
Alabama Forestry Commission.
Alabama Development Office.
Alabama Water Improvement Commission.
Planning and Development Commissions.
Soil and Water Conservation Districts.
Water Management or Drainage Districts.
Watershed Conservancy Districts.

Mississippi

Mississippi Park Commission.
Mississippi Game and Fish Commission.
Mississippi Forestry Commission.
Tombigbee River Valley Water Management District.
Soil and Water Conservation Districts.
Planning and Development Districts.
Water Management or Drainage Districts.

Preservation of Environmental Elements

The protection of environmental elements such as natural and scenic areas, ecological sites, archaeological sites, and historic sites rests primarily with the local and state agencies. Many of these sites depend on recognition by the local interest areas first, and by information and education programs to create additional interest so that agencies with programs to provide technical assistance as well as financial assistance will become interested and make their programs available. Some sites can be protected by using some of the same programs that provide recreation facilities. In addition, other agencies that have interests in these features are: the Alabama Historical Commission, the Alabama Legislature, the Mississippi Department of Archives and History, and the Mississippi Legislature.

APPENDIX

Floodwater Damages
Sub-basin 34b - Old West Fork Tombigbee River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	13,683	96,125	109,808
Flood damages				
Crops & pasture	Dollars	142,900	461,453	604,353
On-farm improvements	Dollars	57,100	44,200	101,300
Roads, bridges & RR's	Dollars	8,100	31,595	39,695
Urban	Dollars	—	—	—
Other	Dollars	—	54,816	54,816
Total damages	Dollars	208,100	592,064	800,164

Floodwater Damages
Sub-basin 34a - Old [illegible] Tombigbee River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	20,633	156,616	177,249
Flood damages				
Crops & pasture	Dollars	308,521	1,429,299	1,737,820
On-farm improvements	Dollars	161,700	161,426	323,126
Roads, bridges & RR.'s	Dollars	81,500	179,726	261,226
Urban	Dollars	30,600	500	31,100
Other	Dollars	—	177,146	177,146
Total damages	Dollars	582,321	1,948,097	2,530,418

Floodwater Damages
Sub-basin 34c - Buttahatchee River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	28,798	87,960	116,758
Flood damages				
Crops & pasture	Dollars	647,900	447,245	1,095,145
On-farm improvements	Dollars	289,400	92,050	381,450
Roads, bridges & RR.'s	Dollars	121,200	110,250	231,450
Urban	Dollars	29,900	—	29,900
Other	Dollars	—	64,955	64,955
Total damages	Dollars	1,088,400	714,500	1,802,900

Floodwater Damages
Sub-basin 34d - Tibbee River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	25,438	129,908	155,346
Flood damages				
Crops & pasture	Dollars	167,600	1,233,332	1,400,932
On-farm improvements	Dollars	88,700	83,299	171,999
Roads, bridges & RR.'s	Dollars	5,100	173,246	178,346
Urban	Dollars	—	7,934	7,934
Other	Dollars	—	138,841	138,841
Total damages	Dollars	261,400	1,636,652	1,898,052

Floodwater Damages
Sub-basin 34e - Sipsey River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	42,535	68,826	111,361
Flood damages				
Crops & pasture	Dollars	434,500	351,688	786,188
On-farm improvements	Dollars	12,900	96,339	109,239
Roads, bridges & RR.'s	Dollars	29,100	83,500	112,600
Urban	Dollars	—	—	—
Other	Dollars	—	53,084	53,084
Total damages	Dollars	476,500	584,611	1,061,111

Floodwater Damages
Sub-basin 34f - Noxubee River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	59,657	165,718	225,375
Flood damages				
Crops & pasture	Dollars	420,000	1,185,285	1,605,285
On-farm improvements	Dollars	107,400	220,050	327,450
Roads, bridges & RR.'s	Dollars	25,800	198,715	224,515
Urban	Dollars	—	—	—
Other	Dollars	—	160,405	160,405
Total damages	Dollars	553,200	1,764,455	2,317,655

Floodwater Damages
Sub-basin 34U - Upper Tombigbee River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	159,518	261,711	421,229
Flood damages				
Crops & pasture	Dollars	471,300	1,310,230	1,781,530
On-farm improvements	Dollars	105,300	372,548	477,848
Roads, bridges & RR.'s	Dollars	51,500	343,946	395,446
Urban	Dollars	910,300	62,457	972,757
Other	Dollars	—	209,547	209,547
Total damages	Dollars	1,538,400	2,298,728	3,837,128

Floodwater Damages
Sub-basin 34h - Sucarnoochee River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	15,961	90,700	106,661
Flood damages				
Crops & pasture	Dollars	29,300	287,360	316,660
On-farm improvements	Dollars	16,700	153,050	169,750
Roads, bridges & RR.'s	Dollars	1,000	98,850	99,850
Urban	Dollars	—	200	200
Other	Dollars	—	53,946	53,946
Total damages	Dollars	47,000	593,406	640,406

Floodwater Damages
Sub-basin 34L - Lower Tombigbee River

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	306,986	379,702	686,688
Flood damages				
Crops & pasture	Dollars	482,800	834,626	1,317,426
On-farm improvements	Dollars	151,800	459,034	610,834
Roads, bridges & RR.'s	Dollars	55,300	341,350	396,650
Urban	Dollars	55,900	5,000	60,900
Other	Dollars	—	163,945	163,945
Total damages	Dollars	745,800	1,803,955	2,549,755

Floodwater Damages
Tombigbee River Basin Total

Item	Units	Principal streams	Upstream watersheds	Total
Floodplain	Acres	673,209	1,437,266	2,110,475
Flood damages				
Crops & pasture	Dollars	3,104,821	7,540,518	10,645,339
On-farm improvements	Dollars	991,000	1,681,996	2,672,996
Roads, bridges & RR.'s	Dollars	378,600	1,561,178	1,939,778
Urban	Dollars	1,026,700	76,091	1,102,791
Other	Dollars	—	1,076,685	1,076,685
Total damages	Dollars	5,501,121	11,936,468	17,437,589

LEGEND

- Roads
- 17 / 43 — State Highway Numbers / Federal Highway Numbers
- Railroads
- Study Area Boundary
- Sub-Basin Boundary
- 34 — Sub-Basin Number
- County Line
- State Line

Source: Soil Conservation Service, United States Department of Agriculture

Map A.1

FLOODWATER DAMAGES

TOMBIGBEE RIVER BASIN
MISSISSIPPI-ALABAMA

August, 1976

Table A.1. Floodplain acreage along principal streams and in upstream watersheds, by sub-basins, Tombigbee River Basin, 1970

Sub-basin number and name	Sub-basin total area	Principal stream		Upstream			Total	
		Floodplain area	Part of total area	Total area	Floodplain area	Part of upstream total area	Floodplain area	Part of total area
	Acres	Acres	Percent	Acres	Acres	Percent	Acres	Percent
34 Upper - Upper Tombigbee River	1,601,827	159,518	10.0	1,442,309	261,711	18.1	421,229	26.3
34 Lower - Lower Tombigbee River	2,700,349	306,986	11.4	2,393,363	379,702	15.9	686,688	23.2
34a - Old East Fork Tombigbee River	758,569	20,633	2.8	737,936	156,616	21.2	177,249	23.4
34b - Old West Fork Tombigbee River	445,647	13,683	3.1	431,964	96,125	22.3	109,808	24.7
34c - Buttahatchee River	565,010	28,798	5.1	536,212	87,960	16.4	116,758	20.7
34d - Tibbee River	711,204	25,438	3.6	685,766	129,908	22.7	155,346	21.8
34e - Sipsey River	507,346	42,535	8.4	464,811	68,826	14.8	111,361	21.9
34f - Noxubee River	889,138	59,657	6.7	829,481	165,718	20.0	225,375	25.3
34h - Sucarnoochee River	623,968	15,961	2.6	608,007	90,700	14.9	106,661	17.1
Basin	8,803,058	673,209	7.6	8,129,849	1,437,266	17.7	2,110,475	24.0

Source: Soil Conservation Service, United States Department of Agriculture.

Table A.2. Inventory land with a wetness hazard by class and sub-class and major land use, Tombigbee River Basin, 1970

Class, Sub-Class and Sub-Basin	Major Land Use												Total		
	Cropland			Pastureland			Forestland			Other Land					
	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total
	1,000 Acres														
34 Upper															
II-IVw	17.0	73.0	90.0	33.5	79.1	112.6	141.8	164.6	306.4	2.1	7.1	9.2	194.4	323.8	518.2
V-VIIw	1.1	1.7	2.8	9.2	-	9.2	119.9	50.5	170.4	0.3	0.2	0.5	130.5	52.4	182.9
Total w Land	18.1	74.7	92.8	42.7	79.1	121.8	261.7	215.1	476.8	2.4	7.3	9.7	324.9	376.2	701.1
34 Lower															
II-IVw	48.3	2.1	50.4	94.6	3.0	97.6	419.1	2.2	421.3	6.3	0.1	6.4	568.3	7.4	575.7
V-VIIw	3.1	-	3.1	26.1	-	26.1	354.5	-	354.5	0.8	-	0.8	384.5	-	384.5
Total w Land	51.4	2.1	53.5	120.7	3.0	123.7	773.6	2.2	775.8	7.1	0.1	7.2	952.8	7.4	960.2
34a															
II-IVw	2.7	96.8	99.5	1.5	30.1	31.6	3.5	89.2	92.7	-	2.6	2.6	7.7	218.7	226.4
V-VIIw	-	-	-	-	-	-	1.9	1.7	3.6	-	-	-	1.9	1.7	3.6
Total w Land	2.7	96.8	99.5	1.5	30.1	31.6	5.4	90.9	96.3	-	2.6	2.6	9.6	220.4	230.0
34b															
II-IVw	-	157.4	157.4	-	21.8	21.8	-	26.7	26.7	-	1.6	1.6	-	207.5	207.5
V-VIIw	-	1.8	1.8	-	-	-	-	3.6	3.6	-	-	-	-	5.4	5.4
Total w Land	-	159.2	159.2	-	21.8	21.8	-	30.3	30.3	-	1.6	1.6	-	212.9	212.9
34c															
II-IVw	13.1	10.2	23.3	7.5	12.4	19.9	32.7	29.9	62.6	0.6	-	0.6	53.9	52.5	106.4
V-VIIw	-	-	-	0.6	-	0.6	26.1	19.3	45.4	-	-	-	26.7	19.3	46.0
Total w Land	13.1	10.2	23.3	8.1	12.4	20.5	58.8	49.2	108.0	0.6	-	0.6	80.6	71.8	152.4
34d															
II-IVw	-	117.6	117.6	-	93.4	93.4	-	146.5	146.5	-	10.9	10.9	-	368.4	368.4
V-VIIw	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total w Land	-	117.6	117.6	-	93.4	93.4	-	146.5	146.5	-	10.9	10.9	-	368.4	368.4
34e															
II-IVw	15.8	-	15.8	8.7	-	8.7	39.1	-	39.1	1.4	-	1.4	65.0	-	65.0
V-VIIw	1.8	-	1.8	6.5	-	6.5	33.8	-	33.8	-	-	-	42.1	-	42.1
Total w Land	17.6	-	17.6	15.2	-	15.2	72.9	-	72.9	1.4	-	1.4	107.1	-	107.1
34f															
II-IVw	14.6	70.1	84.7	16.6	75.8	92.4	23.1	204.4	227.5	-	6.8	6.8	54.3	357.1	411.4
V-VIIw	-	-	-	2.0	-	2.0	2.4	-	2.4	-	-	-	4.4	-	4.4
Total w Land	14.6	70.1	84.7	18.6	75.8	94.4	25.5	204.4	229.9	-	6.8	6.8	58.7	357.1	415.8
34h															
II-IVw	4.7	7.6	12.3	13.0	27.6	40.6	54.9	73.1	128.0	1.2	0.7	1.9	73.8	109.0	182.8
V-VIIw	-	-	-	0.7	-	0.7	25.4	-	25.4	0.3	-	0.3	26.4	-	26.4
Total w Land	4.7	7.6	12.3	13.7	27.6	41.3	80.3	73.1	153.4	1.5	0.7	2.2	100.2	109.0	209.2
Total Basin															
II-IVw	116.2	534.8	651.0	175.4	343.2	518.6	714.2	736.6	1,450.8	11.6	29.8	41.4	1,017.4	1,644.4	2,661.8
V-VIIw	6.0	3.5	9.5	45.1	-	45.1	564.0	75.1	639.1	1.4	0.2	1.6	616.5	78.8	695.3
Total w Land	122.2	538.3	660.5	220.5	343.2	563.7	1,278.2	811.7	2,089.9	13.0	30.0	43.0	1,633.9	1,723.2	3,357.1

Source: Adjusted Conservation Needs Inventory 1967, Soil Conservation Service, United States Department of Agriculture.

Table A.3. Inventory land with a soil properties limitation by class and sub-class and major land use, Tombigbee River Basin, 1970

Class, sub-class and sub-basin	Major Land Use																	
	Cropland			Pastureland			Forestland			Other Land			Total		
	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total
	1,000 Acres														
34 Upper															
II - IVs	2.3	22.6	24.9	1.5	2.7	4.2	15.0	2.0	17.0	0.2	0.9	1.1	19.0	28.2	47.2
VI - VIIs	1.8	-	1.8	4.6	-	4.6	121.1	0.5	121.6	0.3	-	0.3	127.8	0.5	128.3
Total "s" land	4.1	22.6	26.7	6.1	2.7	8.8	136.1	2.5	138.6	0.5	0.9	1.4	146.8	28.7	175.5
34 Lower															
II - IVs	6.4	-	6.4	4.2	-	4.2	44.3	-	44.3	0.6	-	0.6	55.5	-	55.5
VI - VIIs	5.1	-	5.1	13.0	-	13.0	357.7	-	357.7	0.8	-	0.8	376.6	-	376.6
Total "s" land	11.5	-	11.5	17.2	-	17.2	402.0	-	402.0	1.4	-	1.4	432.1	-	432.1
34a															
II - IVs	-	0.5	0.5	-	-	-	-	-	-	-	-	-	-	0.5	0.5
VI - VIIs	-	0.2	0.2	-	0.2	0.2	0.2	0.4	0.6	-	-	-	0.2	0.8	1.0
Total "s" land	-	0.7	0.7	-	0.2	0.2	0.2	0.4	0.6	-	-	-	0.2	1.3	1.5
34b															
II - IVs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VI - VIIs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total "s" land	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34c															
II - IVs	0.3	-	0.3	-	-	-	0.2	-	0.2	-	-	-	0.5	-	0.5
VI - VIIs	-	-	-	-	-	-	12.8	-	12.8	-	-	-	12.8	-	12.8
Total "s" land	0.3	-	0.3	-	-	-	13.0	-	13.0	-	-	-	13.3	-	13.3
34d															
II - IVs	-	0.6	0.6	-	-	-	-	-	-	-	-	-	-	0.6	0.6
VI - VIIs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total "s" land	-	0.6	0.6	-	-	-	-	-	-	-	-	-	-	0.6	0.6
34e															
II - IVs	0.9	-	0.9	-	-	-	5.6	-	5.6	-	-	-	6.5	-	6.5
VI - VIIs	-	-	-	-	-	-	22.1	-	22.1	0.8	-	0.8	22.9	-	22.9
Total "s" land	0.9	-	0.9	-	-	-	27.7	-	27.7	0.8	-	0.8	29.4	-	29.4
34f															
II - IVs	-	2.8	2.8	-	7.0	7.0	-	9.2	9.2	-	0.7	0.7	-	19.7	19.7
VI - VIIs	-	-	-	-	-	-	-	6.1	6.1	-	-	-	-	6.1	6.1
Total "s" land	-	2.8	2.8	-	7.0	7.0	-	15.3	15.3	-	0.7	0.7	-	25.8	25.8
34h															
II - IVs	0.3	0.4	0.7	0.7	0.9	1.6	4.3	5.1	9.4	-	-	-	5.3	6.4	11.7
VI - VIIs	-	0.6	0.6	-	-	-	1.3	3.0	4.3	-	-	-	1.3	3.6	4.9
Total "s" land	0.3	1.0	1.3	0.7	0.9	1.6	5.6	8.1	13.7	-	-	-	6.6	10.0	16.6
Total Basin															
II - IVs	10.2	26.9	37.1	6.4	10.6	17.0	69.4	16.3	85.7	0.8	1.6	2.4	86.8	55.4	142.2
VI - VIIs	6.9	0.8	7.7	17.6	0.2	17.8	515.2	10.0	525.2	1.9	-	1.9	541.6	11.0	552.6
Total "s" land	17.1	27.7	44.8	24.0	10.8	34.8	584.6	26.3	610.9	2.7	1.6	4.3	628.4	66.4	694.8

Source: Adjusted Conservation Needs Inventory 1967, Soil Conservation Service, United States Department of Agriculture.

Table A.4. Inventory land with an erosion hazard by class and sub-class and major land use, Tombigbee River Basin, 1970

Class, sub-class and sub-basin	Major Land Use												Total		
	Cropland			Pastureland			Forestland			Other Land					
	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total	Ala.	Miss.	Total
	1,000 Acres														
34 Upper															
II - IVe	34.1	55.4	89.5	39.7	44.6	84.3	139.9	28.7	168.6	5.9	3.5	9.4	219.6	132.2	351.8
VI - VIIe	4.1	6.0	10.1	15.8	15.8	31.6	162.1	89.7	251.8	1.8	1.2	3.0	183.8	112.7	296.5
Total "e" land	38.2	61.4	99.6	55.5	60.4	115.9	302.0	118.4	420.4	7.7	4.7	12.4	403.4	244.9	648.3
34 Lower															
II - IVe	96.5	3.0	99.5	112.3	1.6	113.9	413.4	1.6	415.0	17.0	0.2	17.2	639.2	6.4	645.6
VI - VIIe	11.9	0.4	12.3	45.6	0.3	45.9	479.4	7.5	486.9	5.1	0.1	5.2	542.0	8.3	550.3
Total "e" land	108.4	3.4	111.8	157.9	1.9	159.8	892.8	9.1	901.9	22.1	0.3	22.4	1,181.2	14.7	1,195.9
34a															
II - IVe	9.3	51.9	61.2	3.2	15.8	19.0	13.8	33.4	47.2	1.0	4.5	5.5	27.3	105.6	132.9
VI - VIIe	1.2	27.1	28.3	-	30.6	30.6	38.3	252.7	291.0	-	3.6	3.6	39.5	314.0	353.5
Total "e" land	10.5	79.0	89.5	3.2	46.4	49.6	52.1	286.1	338.2	1.0	8.1	9.1	66.8	419.6	486.4
34b															
II - IVe	-	30.6	30.6	-	25.9	25.9	-	14.0	14.0	-	2.1	2.1	-	72.6	72.6
VI - VIIe	-	20.8	20.8	-	20.6	20.6	-	87.0	87.0	-	2.0	2.0	-	130.4	130.4
Total "e" land	-	51.4	51.4	-	46.5	46.5	-	101.0	101.0	-	4.1	4.1	-	203.0	203.0
34c															
II - IVe	44.1	2.2	46.3	10.9	1.3	12.2	76.9	5.4	82.3	3.3	-	3.3	135.2	8.9	144.1
VI - VIIe	7.1	0.5	7.6	4.1	0.2	4.3	176.3	45.9	222.2	0.4	-	0.4	187.9	46.6	234.5
Total "e" land	51.2	2.7	53.9	15.0	1.5	16.5	253.2	51.3	304.5	3.7	-	3.7	323.1	55.5	378.6
34d															
II - IVe	-	15.7	15.7	-	49.6	49.6	-	56.6	56.6	-	2.2	2.2	-	124.1	124.1
VI - VIIe	-	14.3	14.3	-	47.8	47.8	-	76.7	76.7	-	2.2	2.2	-	141.0	141.0
Total "e" land	-	30.0	30.0	-	97.4	97.4	-	133.3	133.3	-	4.4	4.4	-	265.1	265.1
34e															
II - IVe	33.8	-	33.8	17.0	-	17.0	106.7	-	106.7	6.3	-	6.3	163.8	-	163.8
VI - VIIe	4.6	-	4.6	7.8	-	7.8	169.9	-	169.9	2.0	-	2.0	184.3	-	184.3
Total "e" land	38.4	-	38.4	24.8	-	24.8	276.6	-	276.6	8.3	-	8.3	348.1	-	348.1
34f															
II - IVe	6.9	25.7	32.6	6.3	45.1	51.4	8.6	88.1	96.7	2.5	2.5	5.0	24.3	161.4	185.7
VI - VIIe	-	4.9	4.9	-	37.7	37.7	-	85.8	85.8	-	1.7	1.7	-	130.1	130.1
Total "e" land	6.9	30.6	37.5	6.3	82.8	89.1	8.6	173.9	182.5	2.5	4.2	6.7	24.3	291.5	315.8
34h															
II - IVe	5.5	20.3	25.8	27.0	20.5	47.5	39.7	71.4	111.1	0.4	6.7	7.1	72.6	118.9	191.5
VI - VIIe	1.2	3.8	5.0	13.3	5.6	18.9	38.4	109.4	147.8	0.8	2.3	3.1	53.7	121.1	174.8
Total "e" land	6.7	24.1	30.8	40.3	26.1	66.4	78.1	180.8	258.9	1.2	9.0	10.2	126.3	240.0	366.3
Total Basin															
II - IVe	230.2	204.8	435.0	216.4	204.4	420.8	799.0	299.2	1,098.2	36.4	21.7	58.1	1,282.0	730.1	2,012.1
VI - VIIe	30.1	77.8	107.9	86.6	158.6	245.2	1,064.4	754.7	1,819.1	10.1	13.1	23.2	1,1[illegible]..2	1,004.2	2,195.4
Total "e" land	260.3	282.6	542.9	303.0	363.0	666.0	1,863.4	1,053.9	2,917.3	46.5	34.8	81.3	2,473.2	1,734.3	4,207.5

Source: Adjusted Conservation Needs Inventory 1967, Soil Conservation Service, United States Department of Agriculture.

Table A.5. Land with critical and other erosion problems, by source, Tombigbee River Basin, 1970

Source and major land use	Unit	Basin total
Critical		
Gullies	Acres	31,118
Roadbanks	Acres	12,239
Strip mines	Acres	18,790
Streambanks	Miles	763
Cropland	Acres	94,662
Pastureland	Acres	113,823
Forestland	Acres	77,509
Other[1/]	1,000 acres	
Cropland	Acres	373.1
Pastureland	Acres	453.8
Forestland	Acres	2,308.4

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ These acres primarily need management systems to improve production efficiency.

Table A.6. Summary of disturbances causing accelerated erosion on forestland, Tombigbee River Basin, 1975

Disturbance	Area	Annual erosion volume	Erosion volume distribution	Average annual erosion rate 1/
	Acres	Tons	Percent	T/A/Yr
General logging	112,500	70,100	1.9	0.62
Skid trails	5,000	14,800	0.4	2.96
Spur roads	5,000	32,700	0.9	6.54
Wildfire	30,000	8,000	0.2	0.27
Grazing	885,500	2,934,400	81.4	3.31
Site preparation practices:				
Chopping	27,000	23,300	0.7	0.86
KG-blade	18,500	323,800	9.0	17.50
Discing	18,500	197,500	5.5	10.68
Total	XXXXXXX	3,604,600	100.0	XXXXX

Source: Forest Service, United States Department of Agriculture.

1/ Rates do not include natural sheet erosion losses of 0.69 tons/acre/year.

Table A.7. Gross erosion and sediment yield, by sub-basin, Tombigbee River Basin, 1970

Sub-basin	Sheet		Gully	Total	
	T/A/Yr	1,000 tons	1,000 tons	T/A/Yr	1,000 tons
34 Upper					
Gross	10.74	17,204.6	595.4	11.11	17,800.0
Yield 1/	2.38	3,821.9	178.1	2.50	4,000.0
34 Lower					
Gross	6.15	16,615.6	539.4	6.35	17,155.0
Yield 1/	1.39	3,763.6	161.4	1.45	3,925.0
34a					
Gross	5.49	4,163.8	536.2	6.20	4,700.0
Yield 1/	1.10	836.8	161.2	1.32	998.0
34b					
Gross	7.07	3,150.9	599.1	8.41	3,750.0
Yield 1/	1.18	525.7	178.3	1.58	704.0
34c					
Gross	6.49	3,667.3	202.7	6.85	3,870.0
Yield 1/	1.27	715.1	60.9	1.37	776.0
34d					
Gross	7.33	5,212.9	387.1	7.87	5,600.0
Yield 1/	1.30	926.8	123.2	1.48	1,050.0
34e					
Gross	7.16	3,632.3	317.7	7.79	3,950.0
Yield 1/	1.66	840.3	94.7	1.84	935.0
34f					
Gross	7.60	6,635.6	364.4	7.87	7,000.0
Yield 1/	1.23	1,096.1	103.9	1.35	1,200.0
34h					
Gross	5.68	3,543.9	106.1	5.85	3,650.0
Yield 1/	1.08	672.7	32.3	1.13	705.0
Basin Total gross	7.25	63,826.9	3,648.1	7.66	67,475.0

Source: River Basin Survey Staff, United States Department of Agriculture.

1/ The sediment yield (in tons) is the amount of sediment entering the Tombigbee River from that particular sub-basin. The sum of the yields does not represent the yield at the outlet of the basin.

Table A.8. Counties by state and area encompassed, Tombigbee River Basin, 1970

Alabama		Mississippi	
County	Part in basin	County	Part in basin
	Percent		Percent
Choctaw	97.8	Chickasaw	75.1
Clark	72.8	Choctaw	11.5
Fayette	65.7	Clarke	3.4
Franklin	9.7	Clay	100.0
Greene	70.6	Itawamba	99.0
Hale	1.1	Kemper	75.5
Lamar	100.0	Lauderdale	34.3
Marengo	83.5	Lee	100.0
Marion	93.7	Lowndes	100.0
Mobile	2.8	Monroe	100.0
Pickens	100.0	Noxubee	100.0
Sumter	100.0	Oktibbeha	98.8
Tuscaloosa	14.0	Pontotoc	40.7
Walker	2.4	Prentiss	76.0
Washington	72.6	Tippah	0.4
Winston	3.3	Tishomingo	25.0
		Union	18.3
		Webster	10.4
		Winston	31.8

Source: Soil Conservation Service, United States Department of Agriculture.

Table A.9. Precipitation, temperature, and growing season data, Tombigbee River Basin

Item	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Booneville, Miss.													
Min. Rain	1.32	1.30	1.30	1.07	0.58	0.17	1.10	0.25	0.25	0.00	0.66	0.68	32.40
Ave. Rain	5.30	5.11	5.94	5.13	4.31	3.84	4.20	3.33	3.04	2.94	4.17	5.53	52.84
Max. Rain	13.65	13.42	15.92	11.35	9.08	10.05	8.46	8.82	13.31	9.76	11.59	14.40	87.02
Min. Temp.	32.9°	34.7°	41.6°	50.2°	58.6°	66.5°	69.5°	68.6°	62.7°	51.1°	40.3°	34.1°	50.9°
Ave. Temp.	40.9°	43.9°	51.8°	60.2°	68.2°	77.1°	79.8°	79.1°	74.1°	62.9°	51.3°	43.4°	61.3°
Max. Temp.	51.3°	53.8°	62.4°	71.8°	79.9°	88.1°	90.5°	90.2°	85.9°	74.9°	62.4°	52.6°	72.0°
32° Frost - Last of spring: earliest 3-4; average 3-26; latest 4-19. First of fall: earliest 10-7; average 11-8; latest 11-30. Average growing season: 226 days. Longest 256 days. Shortest 183 days.													
Haleyville, Ala.													
Min. Rain	1.32	1.79	1.05	0.97	0.61	0.73	0.70	0.58	0.06	0.00	0.86	0.82	39.96
Ave. Rain	6.26	5.84	6.71	5.51	3.98	4.28	5.24	4.12	3.73	2.61	4.32	5.85	58.49
Max. Rain	17.77	11.93	18.12	14.79	9.42	8.82	13.19	9.24	7.13	8.36	11.86	16.26	79.76
Min. Temp.	33.7°	34.8°	40.5°	49.7°	57.9°	65.5°	68.1°	67.4°	61.2°	50.9°	38.8°	33.8°	50.2°
Ave. Temp.	41.5°	43.9°	50.9°	61.1°	68.5°	75.8°	78.2°	77.8°	72.6°	62.5°	50.4°	43.4°	60.6°
Max. Temp.	53.2°	55.9°	62.5°	72.8°	80.1°	87.4°	89.1°	89.4°	83.9°	74.9°	62.0°	54.0°	72.1°
32° Frost - Last of spring: earliest 3-11; average 4-1; latest 4-21. First of fall: earliest 10-16; average 11-8; latest 12-2. Average growing season: 221 days. Longest 266 days. Shortest 185 days.													
Aberdeen, Miss.													
Min. Rain	0.59	1.60	1.70	0.83	0.78	0.56	0.65	0.32	0.35	0.00	0.35	1.34	32.40
Ave. Rain	5.05	5.17	6.02	5.04	3.94	4.19	4.79	3.60	2.81	2.60	3.82	5.33	53.36
Max. Rain	14.42	11.88	13.67	11.93	6.82	11.03	10.96	10.94	10.45	8.80	12.68	14.84	76.83
Min. Temp.	34.8°	36.4°	43.6°	51.4°	59.1°	66.7°	69.6°	68.7°	62.6°	50.0°	40.1°	35.5°	51.5°
Ave. Temp.	44.6°	47.0°	55.0°	63.6°	71.2°	78.7°	81.1°	80.5°	75.2°	64.0°	52.9°	45.9°	63.3°
Max. Temp.	55.3°	57.6°	66.5°	75.7°	83.5°	91.2°	93.0°	92.9°	88.3°	77.9°	65.3°	55.9°	75.3°
32° Frost - Last of spring: earliest 2-23; average 3-22; latest 4-21. First of fall: earliest 10-17; average 11-5; latest 12-2. Average growing season: 228 days. Longest 265 days. Shortest 185 days.													
Fayette, Ala.													
Min. Rain	1.03	1.65	2.10	0.62	0.90	1.26	0.39	0.05	0.00	0.00	0.37	1.22	31.12
Ave. Rain	5.55	5.44	6.69	5.22	3.93	4.24	5.17	3.94	3.11	2.59	4.41	5.29	55.39
Max. Rain	11.32	13.62	13.40	13.56	8.58	11.69	12.31	8.35	8.34	7.51	15.00	14.23	81.38
Min. Temp.	33.1°	35.9°	40.9°	50.4°	58.4°	65.8°	68.5°	67.0°	61.0°	48.2°	38.3°	34.3°	50.2°
Ave. Temp.	43.5°	46.8°	53.0°	62.8°	69.7°	77.0°	79.9°	78.7°	73.3°	62.8°	51.8°	45.4°	62.1°
Max. Temp.	55.1°	59.0°	64.4°	75.2°	82.1°	89.6°	92.7°	91.5°	86.4°	77.5°	64.7°	56.7°	74.6°
32° Frost - Last of spring: earliest 3-12; average 4-1; latest 4-22. First of fall: earliest 10-15; average 11-2; latest 11-14. Average growing season: 216 days. Longest 235 days. Shortest 184 days.													
State University, Miss.													
Min. Rain	0.96	1.49	1.63	0.82	0.22	0.29	0.84	0.70	0.18	0.04	0.42	1.24	31.32
Ave. Rain	5.11	4.88	6.11	4.70	4.02	3.86	4.87	3.65	2.87	2.51	3.57	5.14	51.29
Max. Rain	13.85	9.96	13.52	10.84	7.62	10.03	16.00	9.53	8.66	7.81	11.20	14.13	69.36
Min. Temp.	35.8°	37.8°	44.6°	52.5°	59.5°	67.8°	70.5°	69.8°	64.2°	52.7°	42.7°	37.0°	52.9°
Ave. Temp.	45.2°	47.7°	55.4°	63.9°	71.1°	78.7°	81.0°	80.6°	75.7°	65.0°	54.1°	46.8°	63.6°
Max. Temp.	56.0°	58.7°	66.9°	75.1°	83.0°	90.1°	91.9°	91.9°	87.6°	77.8°	65.7°	57.1°	75.2°
32° Frost - Last of spring: earliest 2-8; average 3-21; latest 4-21. First of fall: earliest 10-17; average 11-9; latest 11-28. Average growing season 233 days. Longest 272 days. Shortest 168 days.													
Columbus, Miss.													
Min. Rain	1.26	1.59	2.20	1.24	0.33	0.53	0.13	0.27	0.32	0.03	0.59	1.57	33.14
Ave. Rain	5.23	5.32	6.13	5.12	3.88	3.73	4.96	3.89	3.08	2.62	4.13	5.20	53.30
Max. Rain	15.64	11.45	11.89	13.01	6.44	7.44	18.93	7.13	12.95	9.95	12.68	13.52	76.88
Min. Temp.	35.2°	36.5°	43.7°	51.4°	59.5°	67.5°	70.5°	69.8°	63.9°	51.8°	41.1°	35.4°	52.2°
Ave. Temp.	45.2°	47.1°	55.0°	63.7°	71.4°	79.2°	81.5°	81.0°	76.3°	64.8°	53.6°	46.2°	63.7°
Max. Temp.	56.6°	58.6°	67.2°	75.8°	83.7°	91.5°	93.1°	93.1°	89.2°	78.5°	66.2°	57.2°	75.9°
32° Frost - Last of spring: earliest 2-9; average 3-24; latest 4-17. First of fall: earliest 10-11; average 11-9; latest 11-28. Average growing season: 229 days. Longest 265 days. Shortest 177 days.													
Louisville, Miss.													
Min. Rain	1.31	1.67	1.63	0.67	0.47	0.43	1.70	0.80	0.05	0.00	0.52	1.14	34.91
Ave. Rain	5.21	5.39	6.08	4.97	4.08	3.75	5.46	3.90	3.15	2.35	3.63	5.25	52.12
Max. Rain	14.81	13.18	11.94	11.30	7.90	8.55	13.01	8.80	11.39	8.84	13.06	15.15	77.84
Min. Temp.	35.8°	37.1°	44.1°	51.2°	59.0°	66.6°	69.3°	68.9°	63.4°	51.8°	41.8°	36.4°	52.1°
Ave. Temp.	45.6°	47.7°	55.3°	63.4°	70.6°	77.8°	80.0°	79.9°	75.2°	64.6°	53.9°	46.7°	63.4°
Max. Temp.	57.0°	59.4°	67.2°	75.3°	82.7°	89.6°	91.2°	91.8°	87.7°	78.1°	66.4°	57.7°	75.3°
32° Frost - Last of spring: earliest 3-1; average 3-24; latest 4-21; First of fall: earliest 10-18; average 11-10; latest 12-1. Average growing season 231 days. Longest 282 days. Shortest 168 days.													

Item	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Macon, Miss.													
Min. Rain	1.63	1.05	1.97	1.50	0.25	0.27	1.15	0.00	0.08	0.00	0.66	0.92	31.90
Ave. Rain	5.16	5.43	6.10	5.40	4.28	3.53	5.10	3.76	3.27	2.59	3.81	5.52	53.14
Max. Rain	14.53	12.64	13.01	13.75	8.08	9.31	12.69	9.70	11.68	9.59	15.47	16.15	80.83
Min. Temp.	35.7°	37.3°	44.4°	51.6°	60.0°	67.6°	70.3°	69.7°	63.8°	51.4°	41.3°	36.1°	52.4°
Ave. Temp.	45.6°	47.7°	55.8°	63.9°	72.1°	79.2°	81.6°	81.1°	76.3°	65.0°	54.1°	46.7°	64.1°
Max. Temp.	56.8°	58.8°	67.6°	75.9°	84.5°	91.4°	93.2°	93.2°	88.7°	79.0°	66.8°	57.5°	76.1°
32° Frost - Last of spring: earliest 2-9; average 3-22; latest 4-16. First of fall: earliest 10-17; average 11-8; latest 12-2. Average growing season 231 days. Longest 282 days. Shortest 188 days.													
Tuscaloosa, Ala. FAA A.P.													
Min. Rain	1.22	1.68	1.38	0.96	0.32	0.61	0.72	0.57	0.52	0.00	0.67	1.17	33.60
Ave. Rain	5.01	5.18	5.77	4.70	3.89	3.64	4.74	3.49	3.00	2.51	3.73	5.13	50.79
Max. Rain	10.50	14.79	10.20	10.89	7.60	8.85	10.06	8.84	7.09	9.18	14.25	12.01	66.47
Min. Temp.	35.4°	37.7°	42.8°	51.1°	59.4°	67.2°	70.0°	69.1°	63.0°	50.5°	39.2°	34.8°	51.7°
Ave. Temp.	45.0°	48.1°	54.8°	64.2°	71.9°	78.8°	81.1°	80.7°	75.3°	64.3°	52.8°	46.4°	63.6°
Max. Temp.	57.6°	61.1°	67.2°	77.1°	84.4°	91.4°	93.2°	93.4°	87.2°	77.8°	66.2°	57.9°	76.2°
32° Frost - Last of spring: earliest 2-23; average 3-16; latest 4-21. First of fall: earliest 10-7; average 11-10; latest 12-2. Average growing season 239 days. Longest 313 days. Shortest 185 days.													
Livingston, Ala. 2 SW													
Min. Rain	1.27	1.65	2.47	1.51	0.10	0.38	2.48	1.13	0.05	0.00	0.60	1.73	32.92
Ave. Rain	4.70	5.06	6.10	4.71	3.82	4.05	5.76	3.66	2.84	2.26	3.25	5.22	51.39
Max. Rain	11.66	12.37	13.82	14.41	10.40	7.90	15.94	12.25	11.36	10.43	14.41	13.66	76.69
Min. Temp.	35.5°	38.3°	45.2°	51.7°	60.4°	68.4°	70.9°	70.5°	64.2°	51.6°	41.2°	36.5°	52.9°
Ave. Temp.	46.1°	49.1°	56.0°	63.9°	71.9°	78.9°	81.1°	80.5°	75.6°	64.3°	53.7°	46.9°	64.0°
Max. Temp.	57.2°	60.2°	68.0°	75.3°	83.5°	90.0°	91.4°	91.3°	86.9°	77.3°	66.4°	58.1°	75.5°
32° Frost - Last of spring: earliest 3-10; average 3-28; latest 4-21. First of fall: earliest 10-17; average 11-3; latest 11-27. Average growing season 220 days. Longest 268 days. Shortest 185 days.													
Pushmataha, Ala.													
Min. Rain	1.40	1.85	1.14	1.24	0.17	0.49	1.62	0.11	0.00	0.00	0.29	2.03	25.03
Ave. Rain	5.12	5.56	5.76	5.05	4.27	4.48	5.61	4.11	3.51	2.31	3.41	5.45	54.62
Max. Rain	14.27	13.16	11.95	17.50	7.69	8.82	15.78	10.16	13.69	8.62	9.15	13.19	71.23
Min. Temp.	37.6°	39.1°	45.6°	52.1°	60.3°	68.0°	70.5°	69.9°	64.6°	52.3°	42.5°	37.7°	53.4°
Ave. Temp.	48.1°	50.3°	57.3°	64.3°	71.9°	78.7°	80.6°	80.3°	75.7°	65.2°	55.0°	48.5°	64.6°
Max. Temp.	59.5°	62.0°	69.6°	76.4°	83.5°	89.6°	90.6°	90.7°	86.9°	78.3°	67.7°	60.0°	76.2°
32° Frost - Last of spring: earliest 3-9; average 3-21; latest 4-21. First of fall: earliest 10-17; average 11-10; latest 11-27. Average growing season 234 days. Longest 257 days. Shortest 185 days.													
Thomasville, Ala.													
Min. Rain	1.21	1.98	1.42	1.34	0.01	0.25	0.10	0.59	0.32	0.00	0.56	1.48	36.64
Ave. Rain	4.85	5.41	6.39	4.57	4.21	4.09	5.94	4.67	3.41	2.53	3.45	5.18	54.69
Max. Rain	11.27	14.33	14.90	14.30	10.83	9.38	12.07	11.26	11.91	9.16	13.92	18.20	83.27
Min. Temp.	38.0°	39.0°	45.8°	52.4°	60.6°	67.5°	69.6°	69.3°	64.7°	53.8°	43.3°	38.5°	53.5°
Ave. Temp.	48.0°	49.8°	57.5°	65.0°	72.1°	79.2°	80.7°	80.4°	76.2°	65.9°	55.5°	49.2°	65.0°
Max. Temp.	59.9°	62.1°	69.6°	76.9°	84.8°	91.4°	92.1°	91.9°	87.8°	78.2°	67.8°	59.9°	76.9°
32° Frost - Last of spring: earliest 2-11; average 3-17; latest 4-15. First of fall: earliest 10-18; average 11-14; latest 12-2. Average growing season 236 days. Longest 313 days. Shortest 193 days.													
Waynesboro, Miss.													
Min. Rain	1.97	1.70	1.40	1.06	0.23	0.28	2.02	1.10	0.13	0.00	0.19	1.92	37.69
Ave. Rain	4.85	5.35	6.18	5.14	4.26	4.51	6.12	4.62	3.61	2.47	3.51	5.79	56.37
Max. Rain	9.27	15.16	15.64	12.16	10.67	11.49	13.20	10.94	15.29	12.45	17.24	16.86	78.65
Min. Temp.	36.3°	41.3°	43.9°	53.7°	60.5°	66.3°	69.9°	69.1°	65.1°	53.3°	43.2°	38.2°	53.4°
Ave. Temp.	47.4°	50.9°	57.2°	66.6°	72.1°	78.3°	80.6°	80.1°	76.1°	65.7°	55.3°	49.9°	65.0°
Max. Temp.	59.7°	64.7°	69.2°	80.0°	85.7°	91.8°	93.6°	93.7°	88.8°	79.1°	68.9°	62.7°	78.2°
32° Frost - Last of spring: earliest 2-24; average 3-24; latest 4-21. First of fall: earliest 9-30; average 11-9; latest 12-10. Average growing season 230 days. Longest 262 days. Shortest 195 days.													
Citronelle, Ala.													
Min. Rain	1.10	1.40	0.78	1.56	0.24	0.83	2.19	0.80	0.84	0.00	0.17	2.01	35.16
Ave. Rain	4.96	5.61	6.46	5.28	4.65	5.42	7.40	6.00	4.96	3.03	3.75	5.34	62.95
Max. Rain	14.16	12.81	15.85	12.13	13.20	14.32	21.05	15.62	14.03	11.55	21.75	13.59	96.22
Min. Temp.	42.5°	44.3°	50.0°	56.1°	63.5°	69.8°	71.7°	71.4°	68.0°	58.1°	48.4°	43.1°	57.2°
Ave. Temp.	52.2°	54.6°	60.5°	66.9°	74.0°	79.6°	80.9°	81.1°	77.7°	68.7°	59.1°	53.1°	67.4°
Max. Temp.	62.6°	65.1°	71.1°	77.9°	84.1°	89.6°	90.1°	90.5°	87.4°	79.8°	70.0°	63.2°	77.6°
32° Frost - Last of spring: earliest 2-1; average 2-28; latest 3-29. First of fall: earliest 10-19; average 11-29; latest 12-28. Average growing season 275 days. Longest 309 days. Shortest 204 days.													

Source: National Oceanic and Atmospheric Administration, United States Department of Commerce.

Table A.10. Monthly maximum, minimum, and average runoff rates at selected gaging stations, Tombigbee River Basin, selected time series, 1929 to 1973

Rate	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
	Inches												
Tombigbee River near Fulton, Miss. (1929-1972)													
Average	0.38	1.06	1.85	3.05	3.29	3.67	2.67	1.61	0.72	0.58	0.34	0.42	19.65
Maximum	4.91	8.50	7.69	8.97	9.65	8.66	7.32	4.83	5.74	2.83	1.33	4.52	34.90
Minimum	0.07	0.12	0.32	0.44	0.73	1.00	0.57	0.28	0.14	0.07	0.05	0.04	8.44
Tombigbee River near Amory, Miss. (1938-1972)													
Average	0.24	0.98	1.82	3.05	3.61	4.00	3.09	1.61	0.74	0.66	0.35	0.37	20.54
Maximum	1.05	8.36	8.58	10.92	9.04	8.95	6.96	4.23	5.52	3.77	1.54	4.32	35.98
Minimum	0.06	0.10	0.25	0.31	0.88	1.01	0.82	0.28	0.14	0.09	0.06	0.04	8.82
Tombigbee River @ Columbus, Miss. (1929-1972)													
Average	0.34	0.76	1.75	2.88	3.23	3.56	2.82	1.53	0.63	0.72	0.32	0.34	18.87
Maximum	5.11	7.32	9.84	11.76	8.45	6.32	6.97	4.46	4.91	5.27	0.92	3.74	34.08
Minimum	0.06	0.09	0.19	0.22	0.57	0.97	0.56	0.24	0.13	0.11	0.06	0.04	7.77
Tombigbee River near Cockrane, Ala. (1939-1973)													
Average	0.24	0.66	1.68	2.88	3.21	3.62	2.96	1.55	0.67	0.77	0.34	0.33	18.90
Maximum	0.94	5.10	8.36	10.40	7.54	8.77	7.18	4.60	4.34	4.75	1.04	3.44	32.20
Minimum	0.07	0.10	0.18	0.23	0.83	1.04	0.54	0.27	0.13	0.12	0.06	0.04	8.36
Tombigbee River @ Demopolis, Ala. (1929-1973)													
Average	0.35	0.71	1.65	2.87	3.20	3.82	3.09	1.58	0.64	0.71	0.43	0.34	19.37
Maximum	3.90	5.57	7.05	8.32	6.99	8.62	7.91	4.10	3.35	1.69	1.44	1.07	33.44
Minimum	0.06	0.11	0.22	0.25	0.73	1.23	0.38	0.30	0.13	0.11	0.06	0.06	9.88
Mackeys Creek near Dennis, Miss. (1939-1972)													
Average	0.65	1.43	1.99	2.68	3.05	3.50	2.56	1.77	0.92	0.80	0.68	0.66	20.69
Maximum	2.33	6.89	5.01	7.34	7.23	9.66	6.16	3.54	4.89	1.84	1.51	3.38	31.49
Minimum	0.20	0.39	0.62	0.83	0.89	1.02	0.89	0.60	0.36	0.23	0.16	0.19	9.56
Bull Mountain Creek near Smithville, Miss. (1941-1972)													
Average	0.35	1.03	2.30	3.38	3.72	3.91	3.15	1.83	0.60	0.59	0.42	0.40	21.69
Maximum	0.80	7.15	10.69	10.53	9.29	7.82	8.25	4.72	1.44	2.09	0.99	2.79	40.85
Minimum	0.11	0.21	0.42	0.47	1.03	1.24	0.95	0.50	0.20	0.16	0.09	0.08	10.89
Old Town Creek near Tupelo, Miss. (1945-1972)													
Average	0.22	1.32	2.39	3.93	4.34	4.55	3.38	1.66	0.59	0.59	0.24	0.45	23.67
Maximum	1.44	12.57	8.89	11.70	11.60	9.86	9.70	6.56	3.26	3.71	1.56	5.09	40.44
Minimum	0.00	0.00	0.04	0.07	0.36	0.51	0.43	0.12	0.05	0.01	0.00	0.00	8.13
Buttahatchee River below Hamilton, Ala. (1942-1970)													
Average	0.42	0.97	2.59	3.60	4.03	4.30	3.54	1.99	0.75	0.67	0.58	0.49	23.93
Maximum	1.28	6.02	11.85	12.57	7.63	8.38	9.01	6.16	1.72	1.92	1.55	1.86	44.00
Minimum	0.15	0.27	0.36	0.50	1.38	1.23	1.03	0.51	0.26	0.25	0.16	0.21	12.43
Chuquatonchee Creek near West Point, Miss. (1944-1972)													
Average	0.17	0.75	1.84	3.32	3.91	3.92	2.91	1.37	0.44	0.55	0.17	0.27	19.63
Maximum	2.64	9.68	11.37	11.05	10.68	8.91	8.81	4.75	2.27	4.02	1.56	4.55	36.21
Minimum	0.00	0.00	0.02	0.04	0.39	0.52	0.27	0.10	0.02	0.02	0.00	0.00	6.58
Tibbee Creek near Tibee, Miss. (1940-1972)													
Average	0.13	0.72	1.72	3.01	3.67	3.78	2.73	1.24	0.32	0.77	0.13	0.20	18.42
Maximum	1.76	11.02	12.80	14.27	9.27	9.26	9.00	6.52	1.78	9.00	1.34	3.98	36.08
Minimum	0.00	0.00	0.02	0.03	0.31	0.56	0.22	0.04	0.01	0.02	0.00	0.00	5.18

Rate	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
	Inches												
Luxapalila Creek near Fayette, Ala. (1945-1970)													
Average	0.60	1.16	2.18	3.29	3.53	3.65	2.89	1.49	0.88	0.84	0.73	0.67	21.96
Maximum	1.27	5.32	5.47	12.13	7.76	6.70	9.21	3.67	2.39	1.46	1.64	1.88	37.19
Minimum	0.36	0.48	0.61	0.63	1.11	1.27	0.67	0.58	0.46	0.38	0.28	0.28	11.59
Luxapalila Creek @ Steens, Miss. (1944-1972)													
Average	0.42	0.95	2.10	3.43	3.69	3.92	2.88	1.46	0.66	0.76	0.49	0.46	21.22
Maximum	1.07	5.12	9.30	14.80	7.58	8.08	8.55	3.69	1.94	3.14	1.18	2.58	38.77
Minimum	0.16	0.26	0.41	0.40	1.08	1.46	0.65	0.45	0.30	0.18	0.12	0.12	11.02
Coal Fire Creek near Pickensville, Ala. (1955-1971)													
Average	0.33	0.65	1.67	1.95	2.70	3.24	2.91	1.25	0.42	0.69	0.39	0.26	16.43
Maximum	0.80	3.20	5.57	5.27	6.69	6.24	6.13	3.90	0.90	3.83	1.12	0.70	22.81
Minimum	0.08	0.25	0.38	0.33	0.87	1.56	0.52	0.33	0.20	0.13	0.10	0.06	9.41
Sipsey River near Elrod, Ala. (1939-1971)													
Average	0.27	0.70	1.72	2.90	3.64	3.81	3.02	1.51	0.64	0.68	0.45	0.35	19.71
Maximum	0.66	4.87	7.92	9.06	7.88	6.59	7.61	3.98	3.12	4.53	2.31	2.83	33.93
Minimum	0.06	0.15	0.28	0.30	1.25	1.34	0.56	0.29	0.14	0.11	0.06	0.06	10.21
Noxubee River @ Macon, Miss. (1939-1972)													
Average	0.14	0.44	1.40	2.31	3.11	3.28	2.51	1.27	0.36	0.72	0.29	0.22	16.04
Maximum	0.56	3.46	9.81	10.82	7.48	7.76	8.99	6.36	2.33	7.55	1.90	2.73	32.15
Minimum	0.05	0.06	0.11	0.10	0.38	0.60	0.16	0.14	0.09	0.03	0.05	0.04	4.14
Noxubee River near Geiger, Ala. (1939-1973)													
Average	0.14	0.41	1.43	2.44	3.18	3.29	2.59	1.19	0.42	0.73	0.31	0.23	16.34
Maximum	0.56	3.06	9.51	10.44	7.81	7.20	7.64	5.23	2.70	7.45	2.20	3.17	36.31
Minimum	0.03	0.05	0.11	0.09	0.40	0.55	0.18	0.11	0.08	0.07	0.04	0.03	3.90
Sucarnoochee River @ Livingston, Ala. (1939-1973)													
Average	0.33	0.63	1.42	2.03	2.74	3.06	2.46	1.33	0.64	0.80	0.52	0.37	16.32
Maximum	1.14	3.97	7.76	6.80	8.52	6.07	6.55	3.70	2.66	4.46	2.25	1.44	32.56
Minimum	0.12	0.16	0.27	0.33	0.74	0.79	0.43	0.31	0.21	0.19	0.12	0.10	8.10
Tuckabum Creek near Butler, Ala. (1955-1970)													
Average	0.28	0.38	1.55	1.69	2.82	2.70	2.60	0.75	0.44	0.79	0.29	0.30	14.48
Maximum	1.70	2.42	7.56	6.33	10.24	7.68	12.63	2.18	1.97	4.41	0.66	1.86	29.03
Minimum	0.02	0.03	0.08	0.08	0.12	0.21	0.27	0.12	0.10	0.08	0.05	0.03	4.95
Okatuppa Creek @ Gilbertown, Ala. (1956-1969)													
Average	0.44	0.58	1.82	2.00	3.10	3.04	1.77	1.10	0.62	0.71	0.43	0.48	16.83
Maximum	1.37	2.38	6.32	4.70	10.08	8.58	4.51	2.30	3.17	3.74	0.89	1.87	26.44
Minimum	0.00	0.03	0.18	0.23	0.42	0.45	0.39	0.12	0.13	0.10	0.05	0.02	6.32
Satilpa Creek near Coffeeville, Ala. (1956-1970)													
Average	0.52	0.75	1.86	1.88	2.83	3.22	2.24	0.91	0.59	0.78	0.39	0.38	16.07
Maximum	2.13	2.79	11.67	4.13	11.31	6.69	5.07	2.52	3.11	5.30	1.29	1.16	32.36
Minimum	0.04	0.06	0.22	0.27	0.64	1.07	0.40	0.19	0.08	0.10	0.08	0.05	6.41
East Bassett Creek @ Walker Springs, Ala. (1956-1970)													
Average	0.70	1.16	1.89	2.04	2.85	3.32	2.56	1.22	1.05	1.08	0.60	0.68	18.90
Maximum	2.44	5.33	8.71	3.66	9.71	6.08	6.40	2.32	3.73	5.79	1.57	2.30	31.88
Minimum	0.12	0.16	0.51	0.84	1.18	1.39	0.60	0.30	0.20	0.30	0.26	0.16	10.17

Source: Water Resources Data, Alabama and Mississippi, United States Department of the Interior.

Table A.11. Land treatment measures installed, Mississippi part, Tombigbee River Basin, as of June 30, 1974.

Practice name	Unit	Sub-basin								Total
		34 upper	34 lower	34a	34b	34c	34d	34f	34h	
Conservation cropping system	Ac.	63,771	31	63,159	93,269	12,535	90,810	45,661	3,736	372,972
Contour farming	Ac.	19,254	272	9,111	9,682	4,940	8,975	11,727	15,501	79,462
Critical area planting	Ac.	2,319	4	4,829	20,454	267	21,103	3,018	2,873	54,867
Crop residue use	Ac.	91,526	111	84,152	132,543	20,084	85,000	65,341	9,945	488,702
Diversion	Ft.	119,464	--	253,406	730,618	25,460	925,502	261,439	4,729	2,320,618
Pond	No.	2,237	22	2,366	2,566	387	4,356	4,739	1,042	17,715
Field border	Ft.	7,490	27	13,229	3,929	554	43,400	34,599	470	103,698
Firebreak	Ft.	408,035	--	374,914	250,403	123,668	338,156	113,833	88,282	1,697,291
Fishpond management	No.	1,054	16	1,106	1,654	155	865	899	400	6,149
Grassed waterway or outlet	Ac.	211	2	190	219	45	955	215	88	1,925
Land smoothing	Ac.	5,114	1	2,620	2,315	940	3,630	7,294	216	22,130
Minimum tillage	Ac.	4,627	--	372	444	1,101	296	4,403	--	11,243
Drainage main or lateral	Ft.	373,756	5,141	630,912	1,780,414	56,326	1,485,338	1,176,756	166,904	5,675,547
Pasture and hayland management	Ac.	107,436	720	65,906	95,649	18,059	136,999	71,897	41,504	538,170
Pasture and hayland planting	Ac.	77,982	527	43,209	53,669	12,020	102,669	28,726	32,121	350,923
Drainage field ditch	Ft.	1,608,226	4,099	799,669	1,442,951	392,864	3,016,932	1,682,418	211,570	9,158,729
Terrace, gradient	Ft.	6,295,185	87,066	1,636,079	480,470	662,562	691,057	639,104	1,895,065	12,386,588
Terrace, parallel	Ft.	39,066	--	12,299	9,372	9,988	3,576	51,313	4,210	129,824
Tree planting	Ac.	25,794	152	22,973	35,283	5,920	33,565	15,166	19,449	158,302
Wildlife wetland management	Ac.	828	--	705	50	90	667	1,317	--	3,657
Wildlife upland management	Ac.	41,086	28	12,366	27,647	9,119	37,134	30,892	1,208	159,480
Woodland improved harvesting	Ac.	29,835	1,452	22,073	6,857	7,137	28,630	19,166	39,999	155,149
Woodland improvement	Ac.	21,254	202	29,147	17,894	4,928	25,256	16,168	9,015	123,864
Cropland to grassland	Ac.	5,331	237	12,788	7,845	2,043	6,976	3,754	4,128	43,102
Cropland to woodland	Ac.	3,425	57	3,600	2,270	954	2,239	2,608	4,792	19,945
Cropland to wildlife-recreation	Ac.	160	23	904	227	44	412	205	448	2,423
Cropland to "other"	Ac.	7,834	14	2,943	331	2,388	767	619	454	15,350
All other uses to cropland	Ac.	14,898	6	8,079	4,878	4,057	21,795	2,252	634	56,599
All other uses (except cropland) to wildlife-recreation	Ac.	30,353	180	4,354	8,815	8,585	5,495	775	3,136	61,693

Source: Soil Conservation Service, United States Department of Agriculture.

Table A.12. Land treatment measures installed, Alabama part, Tombigbee River Basin, as of June 30, 1974.

Practice name	Unit	Sub-basin							Total
		34 upper	34 lower	34a	34c	34e	34f	34h	
Conservation cropping system	Ac.	30,956	55,024	669	5,017	20,464	1,952	5,216	119,298
Contour farming	Ac.	15,030	30,406	920	4,770	12,665	1,112	3,136	68,039
Critical area planting	Ac.	202	877	20	144	413	15	45	1,716
Crop residue use	Ac.	16,727	100,640	1,171	8,337	15,185	2,175	6,757	150,994
Diversion	Ft.	29,942	26,177	1,087	11,717	11,090	1,459	4,063	85,535
Pond	No.	1,055	2,119	147	704	733	98	286	5,142
Field border	Ft.	104,712	649,523	36,816	154,047	85,285	2,402	5,256	1,038,041
Firebreak	Ft.	551,440	1,248,434	238,469	1,394,672	503,745	3,055	--	3,939,815
Fishpond management	No.	769	921	76	417	438	34	93	2,748
Grassed waterway or outlet	Ac.	324	2,090	12	65	294	64	193	3,042
Land smoothing	Ac.	8,261	15,106	3,873	14,719	10,666	1,784	5,380	59,789
Minimum tillage	Ac.	543	74	235	884	342	7	--	2,085
Drainage main or lateral	Ft.	1,540,568	1,072,769	19,580	569,003	628,015	55,265	158,107	4,043,307
Woodland site preparation	Ac.	7,044	33,434	1,924	9,036	4,050	2,670	8,388	66,546
Pasture and hayland management	Ac.	42,399	112,993	4,184	21,963	23,475	8,003	24,208	237,225
Pasture and hayland planting	Ac.	27,848	191,443	6,861	35,033	27,667	11,009	34,723	334,584
Drainage field ditch	Ft.	621,101	580,896	10,878	49,083	227,921	40,951	102,299	1,633,129
Terrace, gradient	Ft.	1,573,082	3,260,548	261,061	1,172,866	1,411,129	111,984	328,140	8,118,810
Terrace, parallel	Ft.	360,174	1,595,032	5,857	43,819	330,740	36,010	107,608	2,479,240
Tree planting	Ac.	36,673	105,657	4,216	17,275	15,584	3,796	10,618	193,819
Wildlife wetland management	Ac.	1,453	3,698	--	393	1,455	55	171	7,225
Wildlife upland management	Ac.	27,233	150,846	4,351	24,294	10,468	1,094	3,029	221,315
Woodland improved harvesting	Ac.	42,395	510,792	3,849	19,720	21,111	13,401	30,076	641,344
Woodland improvement	Ac.	35,886	200,044	6,359	39,384	17,993	8,978	27,512	336,156
Cropland to grassland	Ac.	4,507	16,190	2,176	9,641	3,327	647	2,027	38,515
Cropland to woodland	Ac.	2,731	3,197	2,343	9,574	2,482	243	766	21,336
Cropland to wildlife-recreation	Ac.	324	741	118	570	191	23	72	2,039
Cropland to "other"	Ac.	1,019	1,770	1,004	4,003	1,441	28	85	9,350
All other uses to cropland	Ac.	1,032	24,500	418	1,661	1,678	2,051	6,488	37,828
All other uses (except cropland) to wildlife-recreation	Ac.	3,986	3,668	431	3,526	1,484	174	547	13,816

Source: Soil Conservation Service, United States Department of Agriculture.